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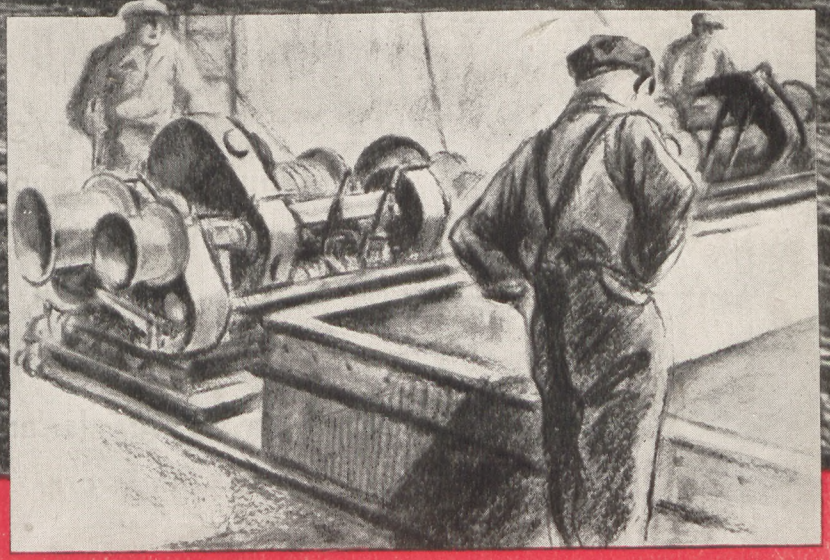

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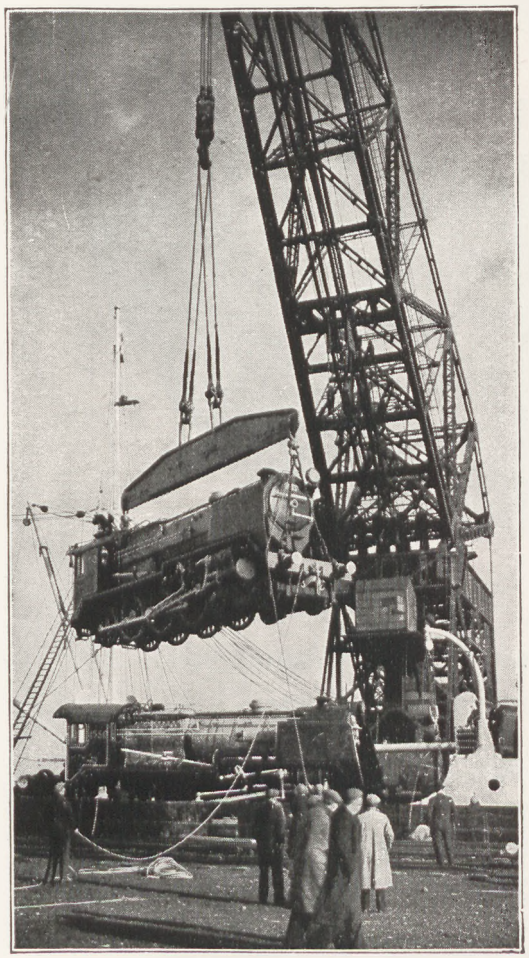

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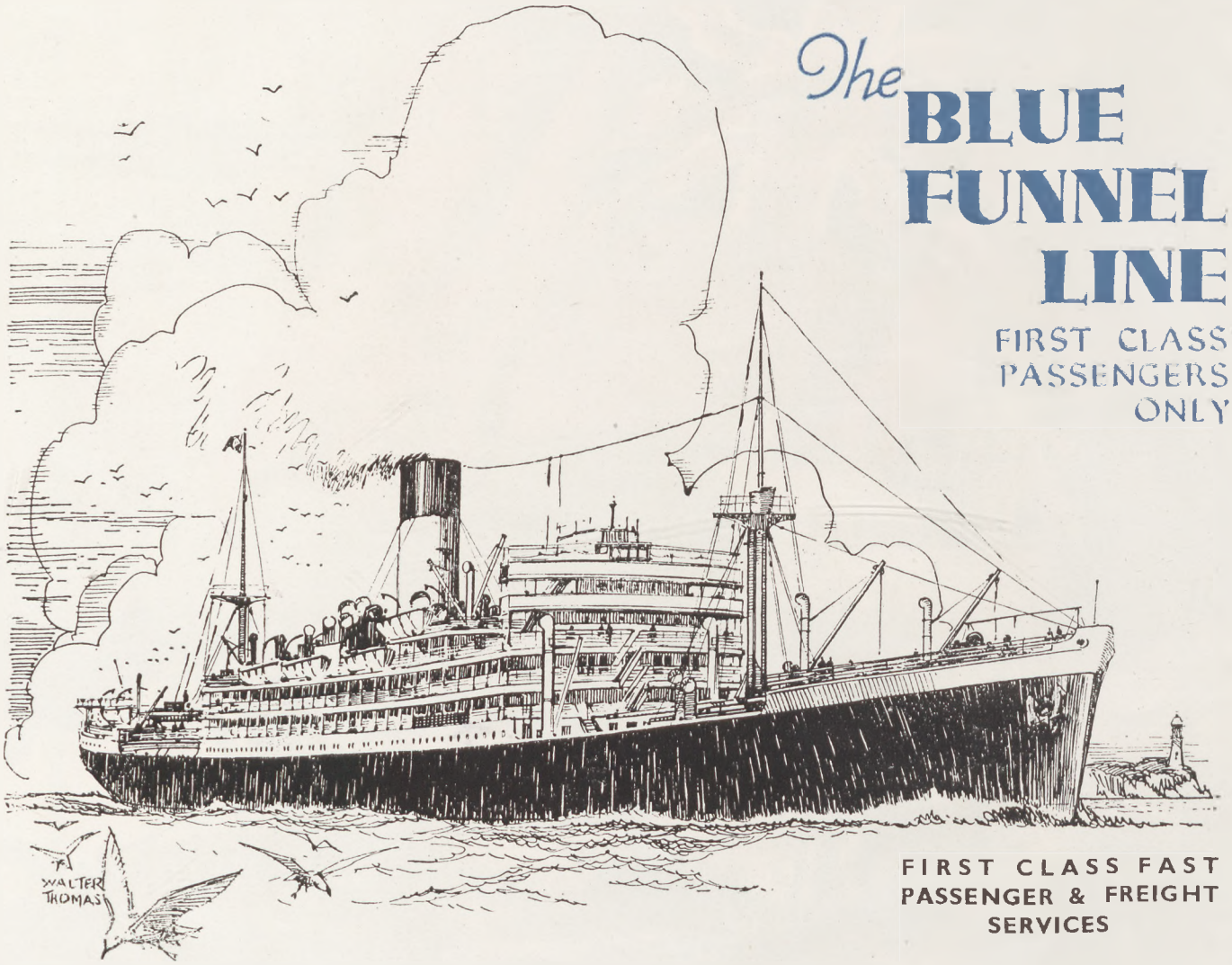

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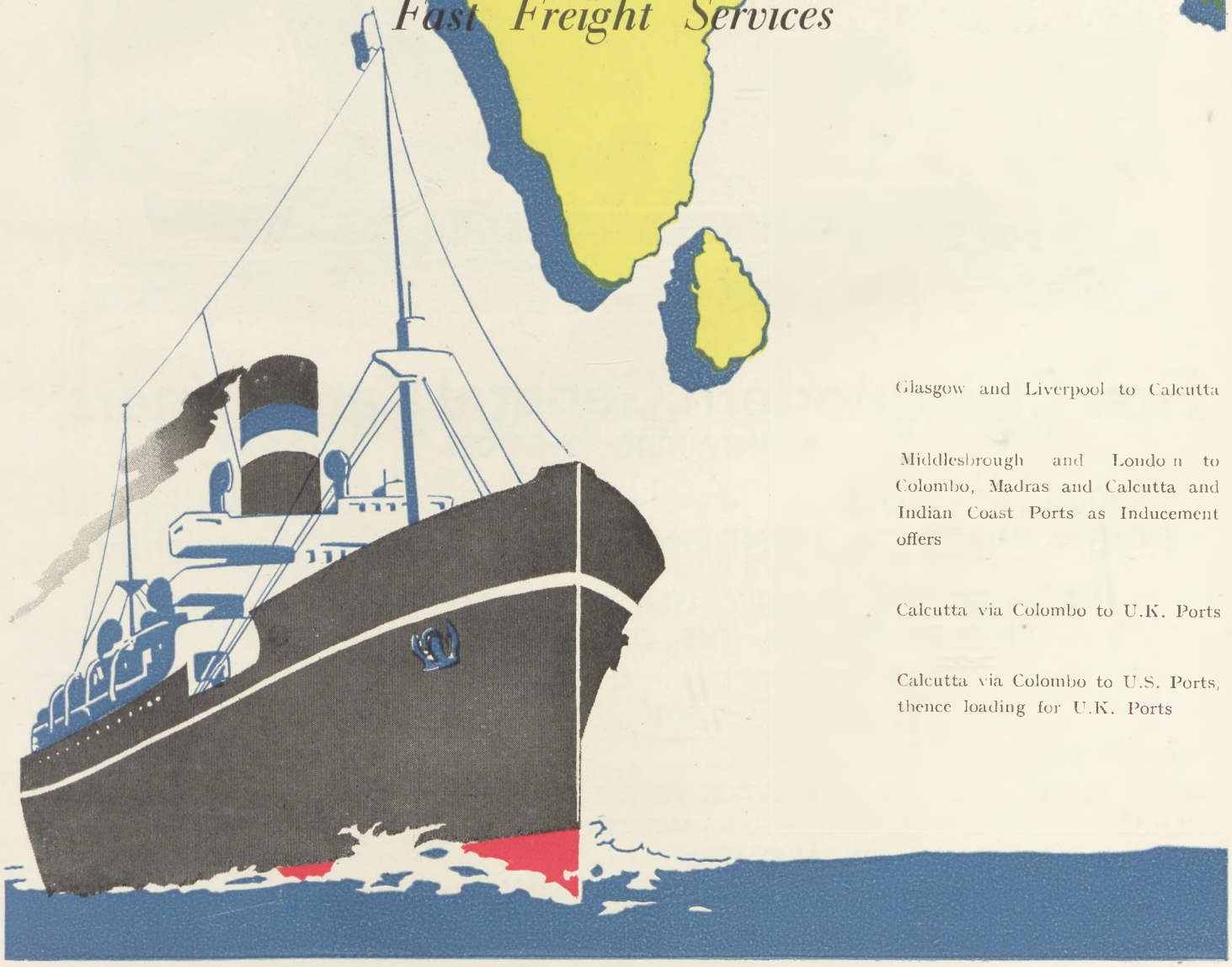

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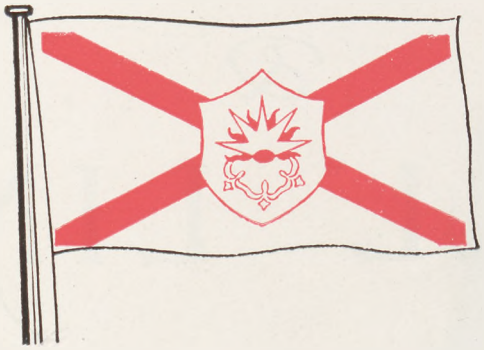

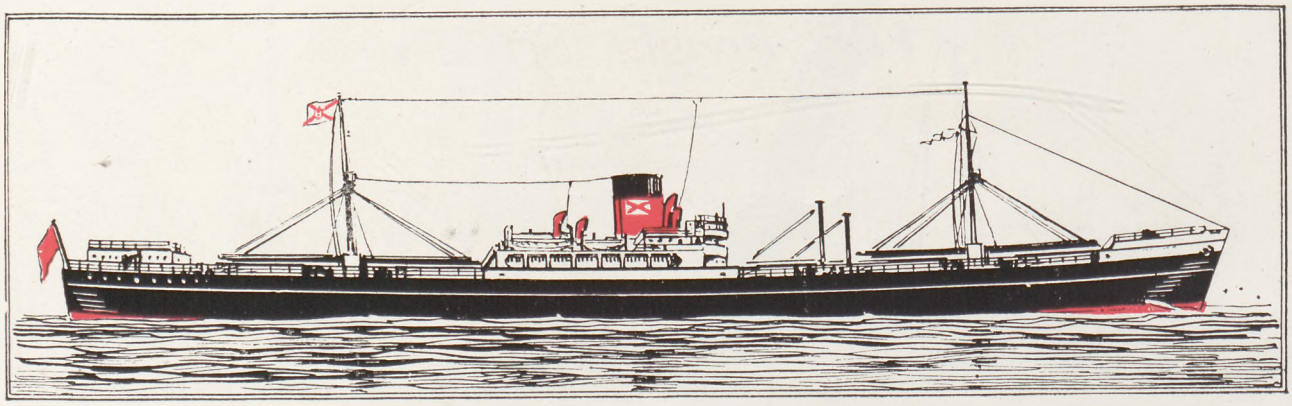

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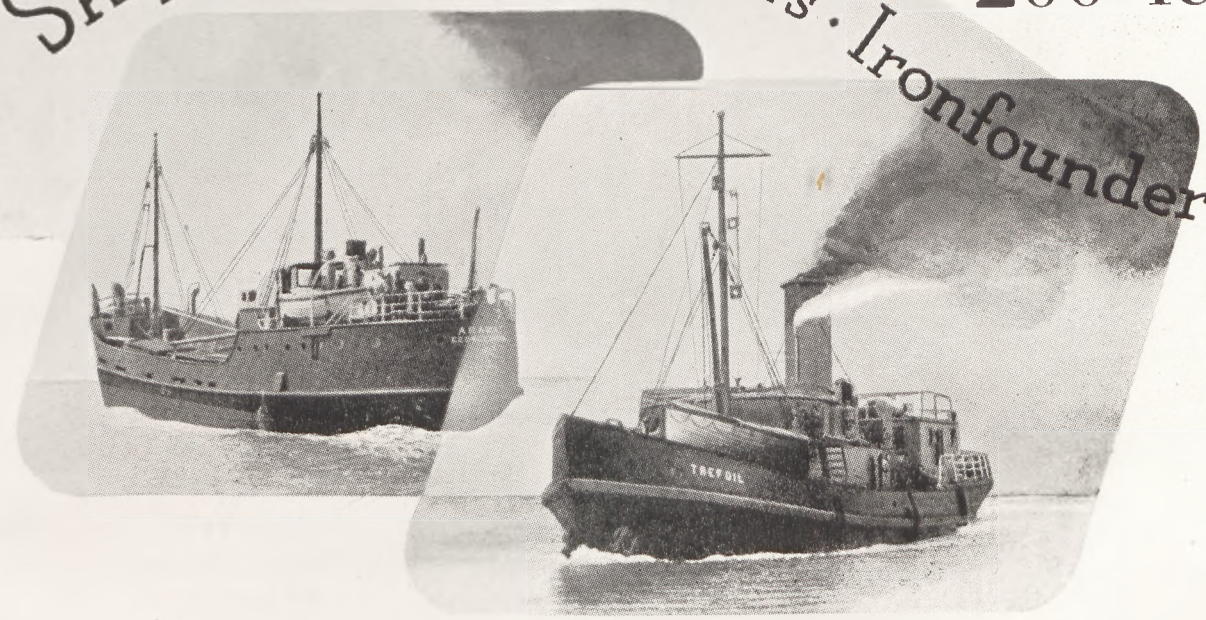

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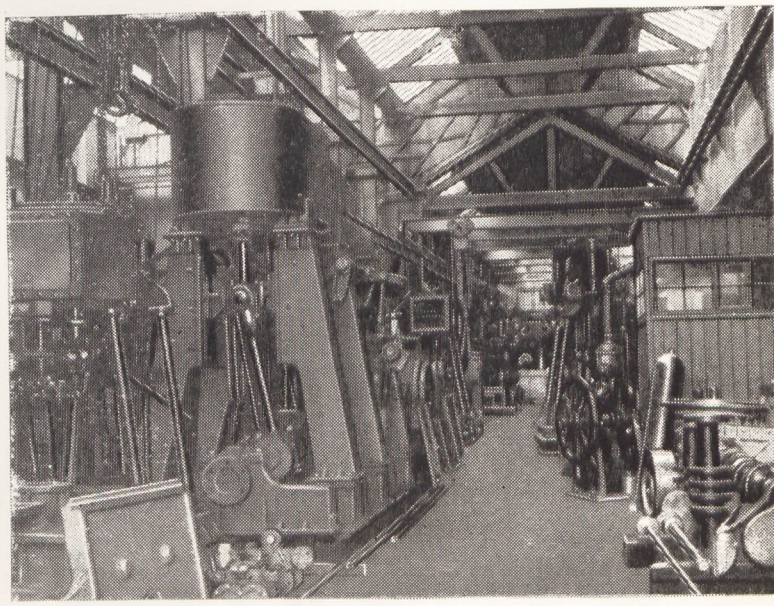

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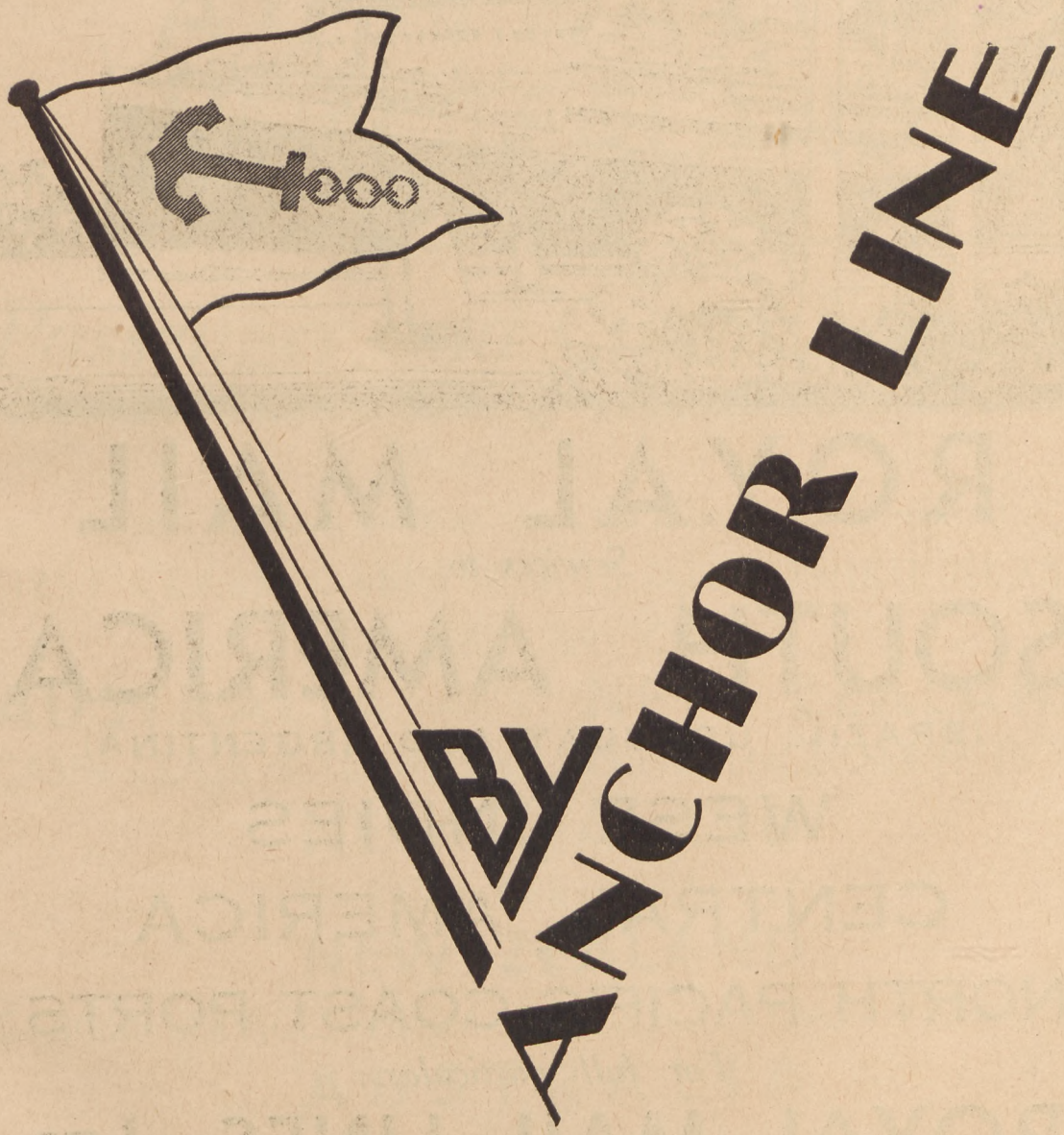

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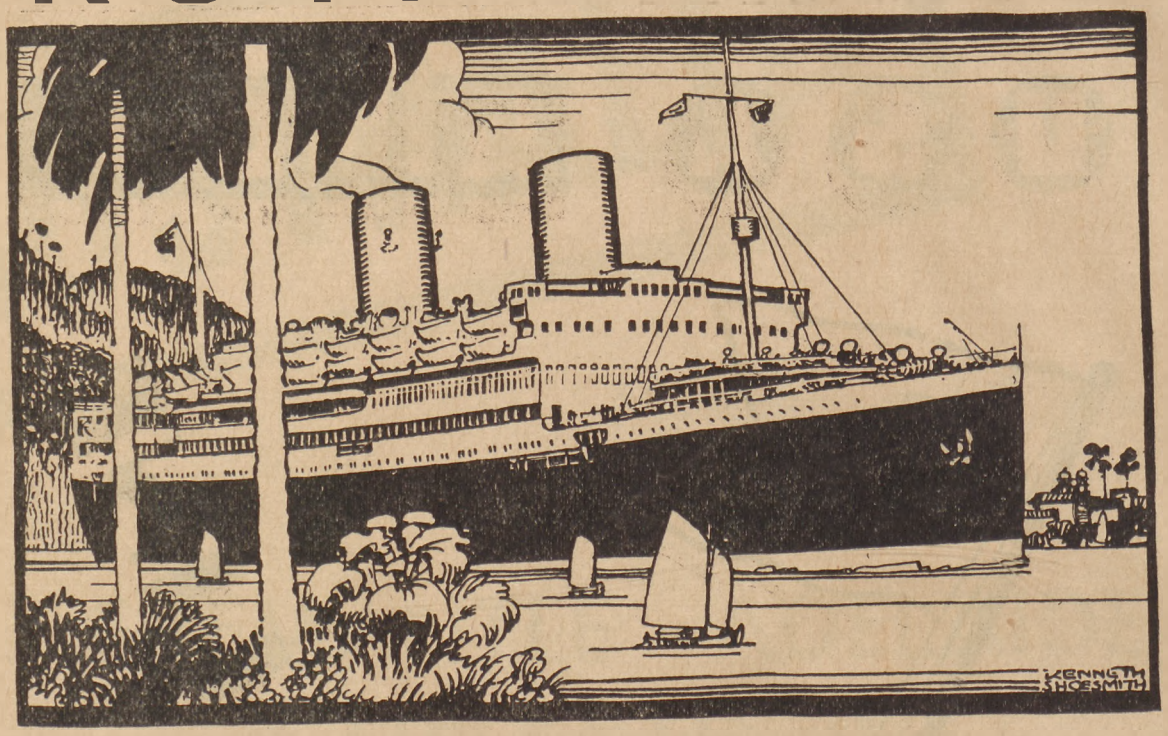

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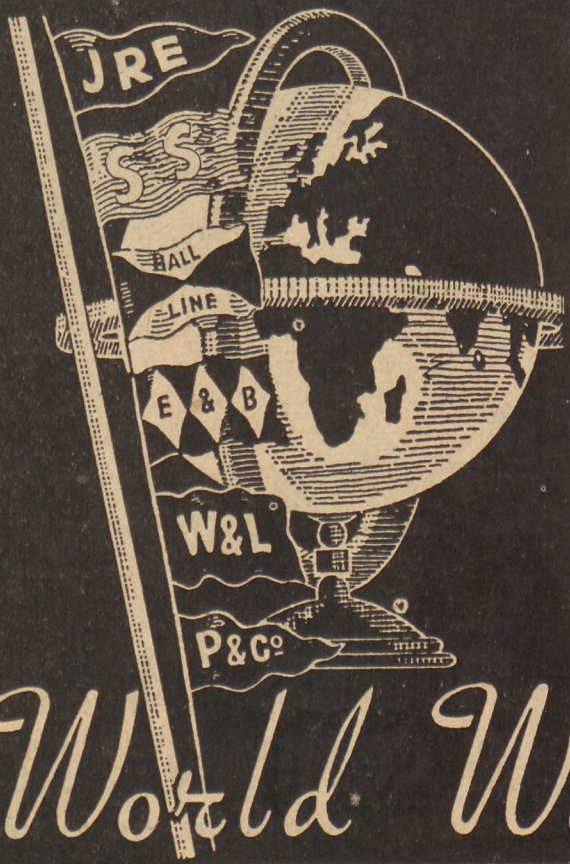

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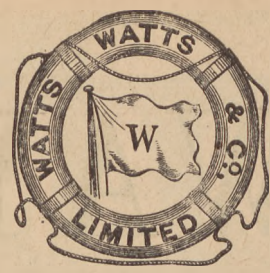

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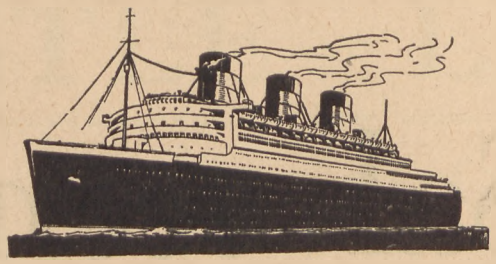

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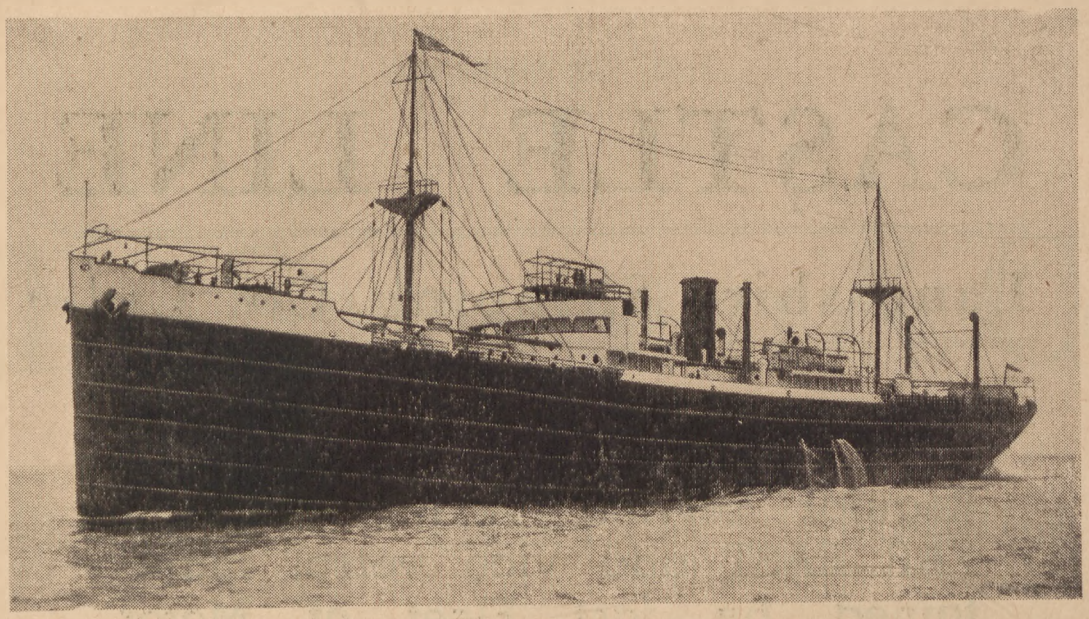

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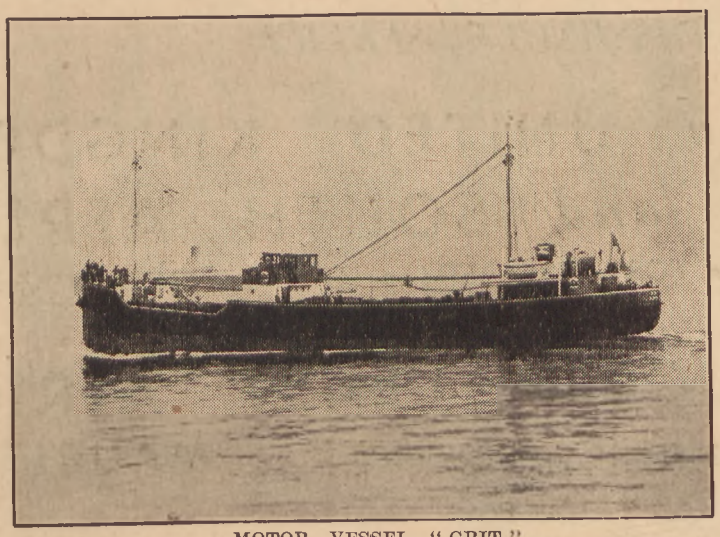

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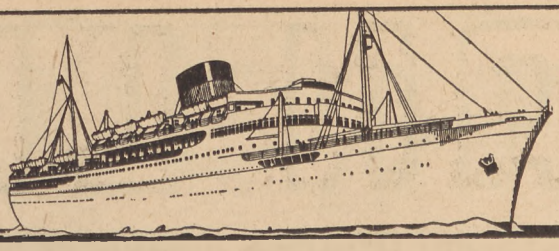

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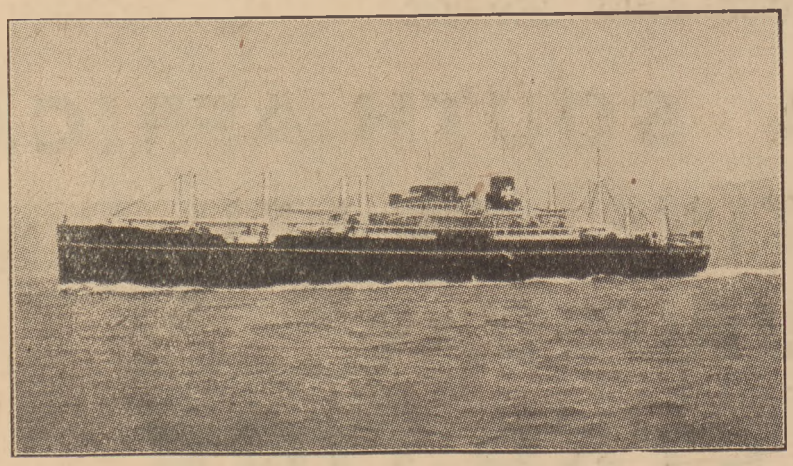

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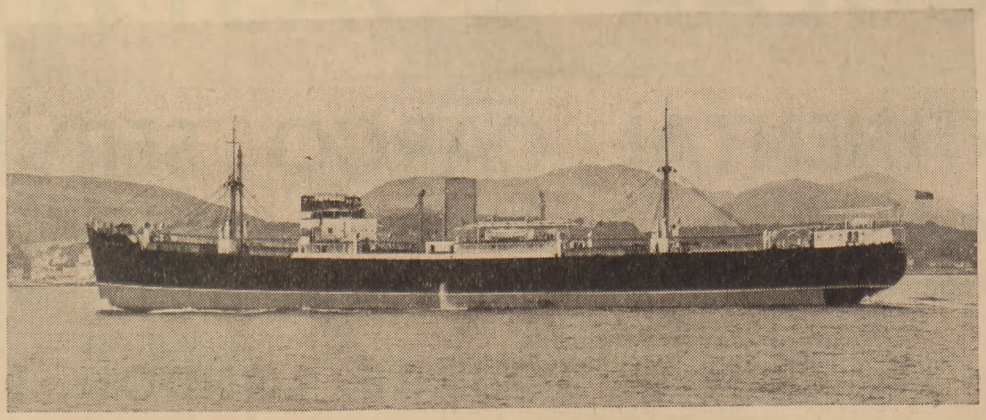

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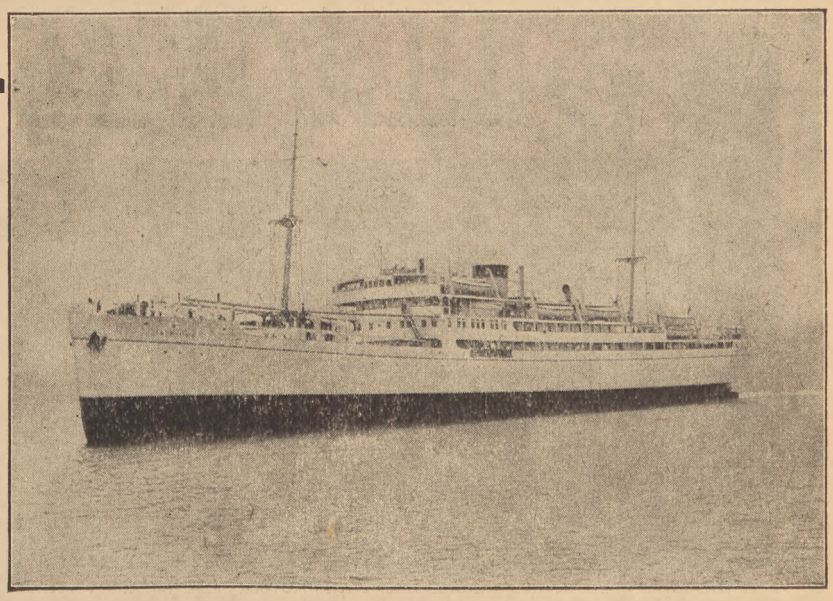

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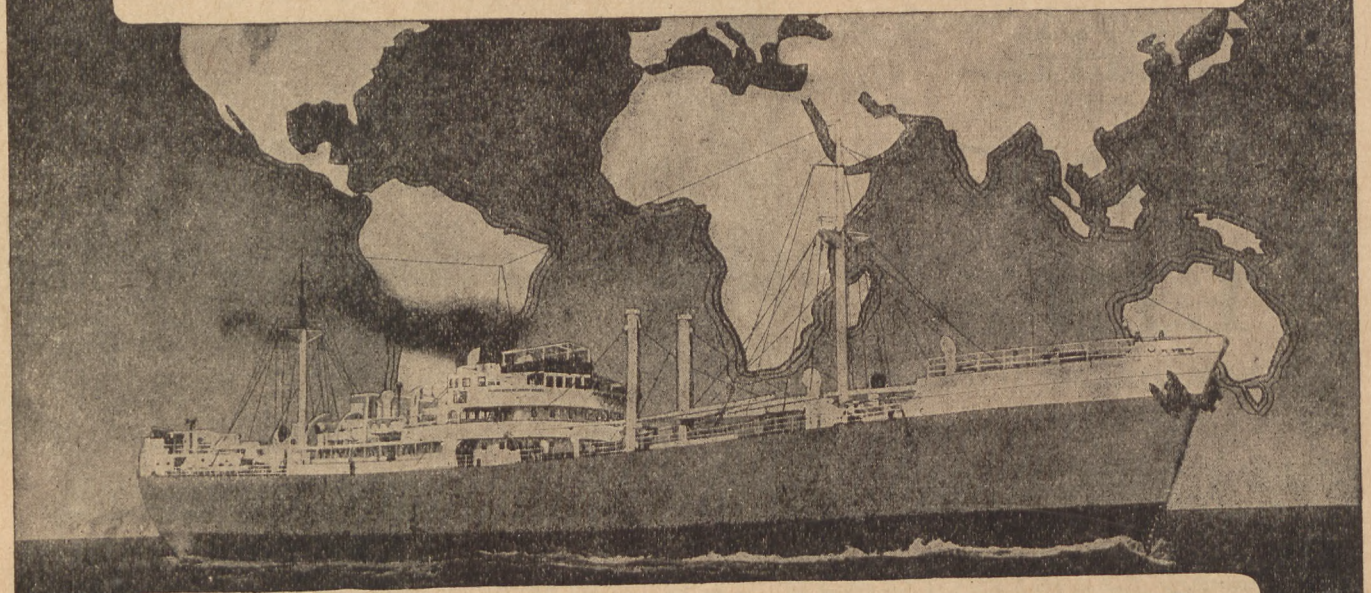

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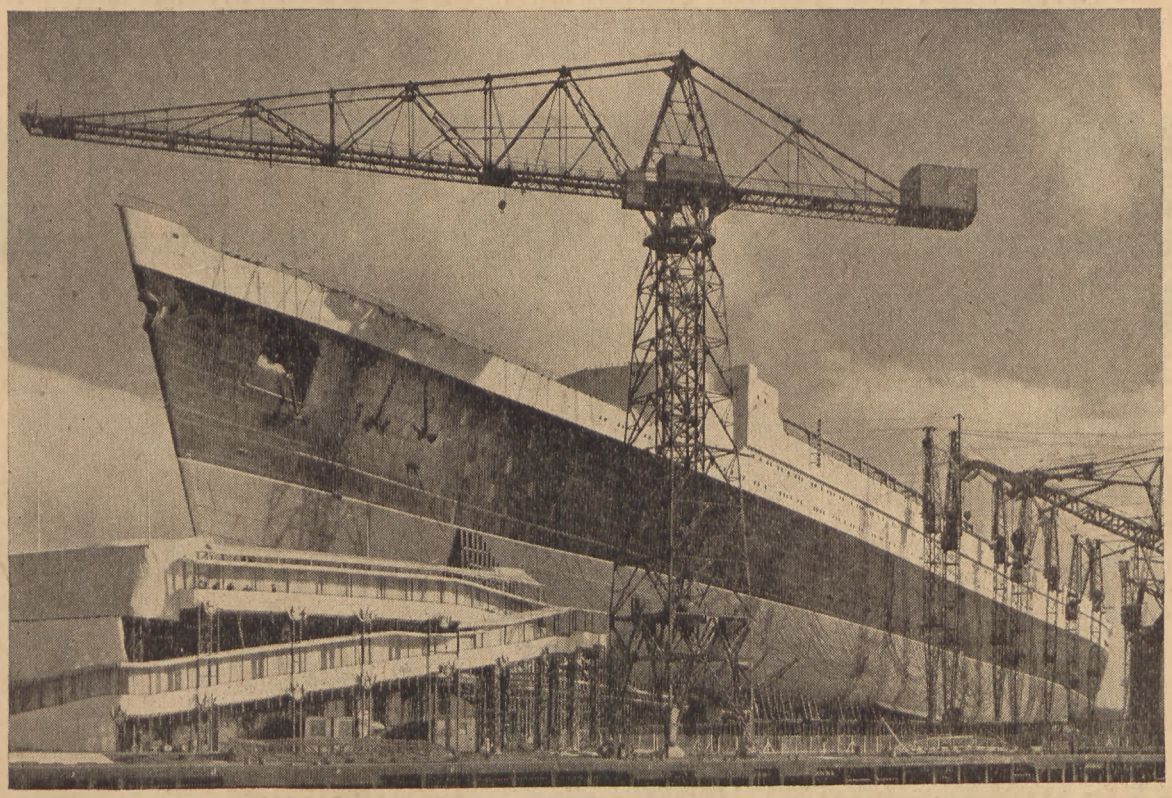

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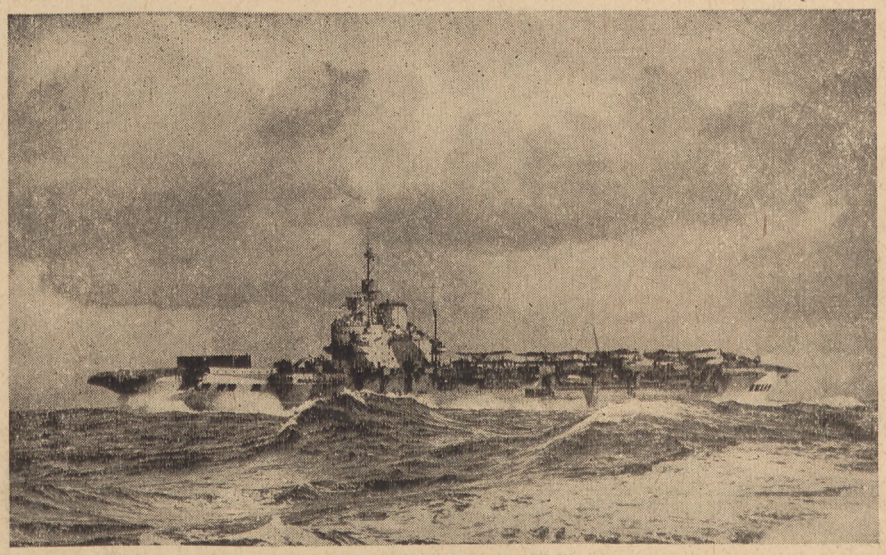

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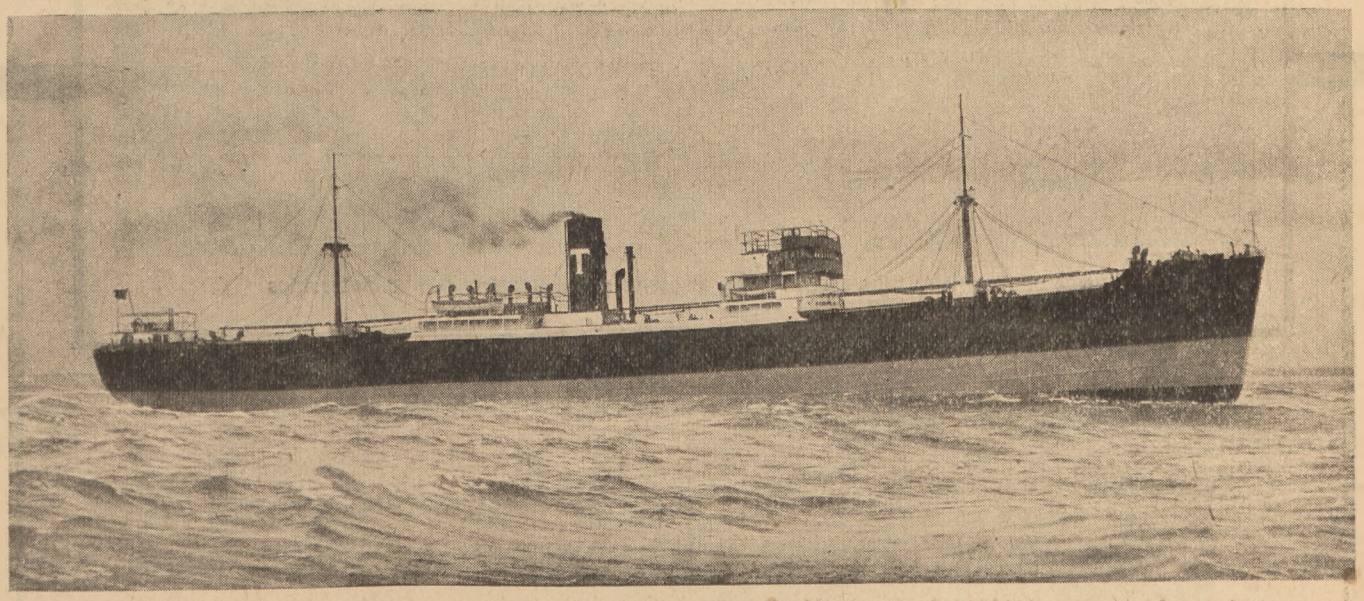

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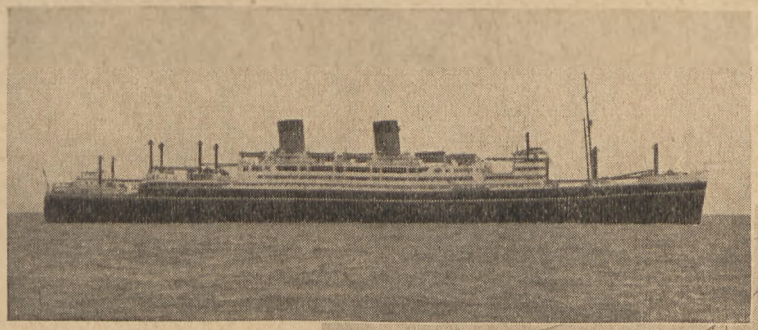

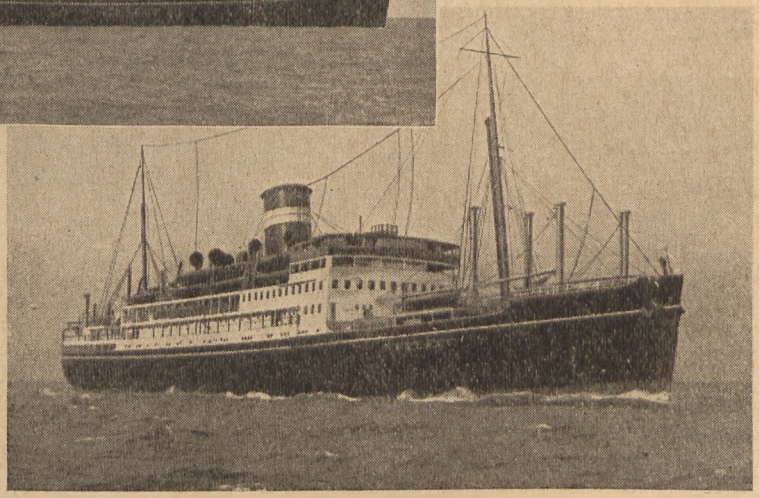

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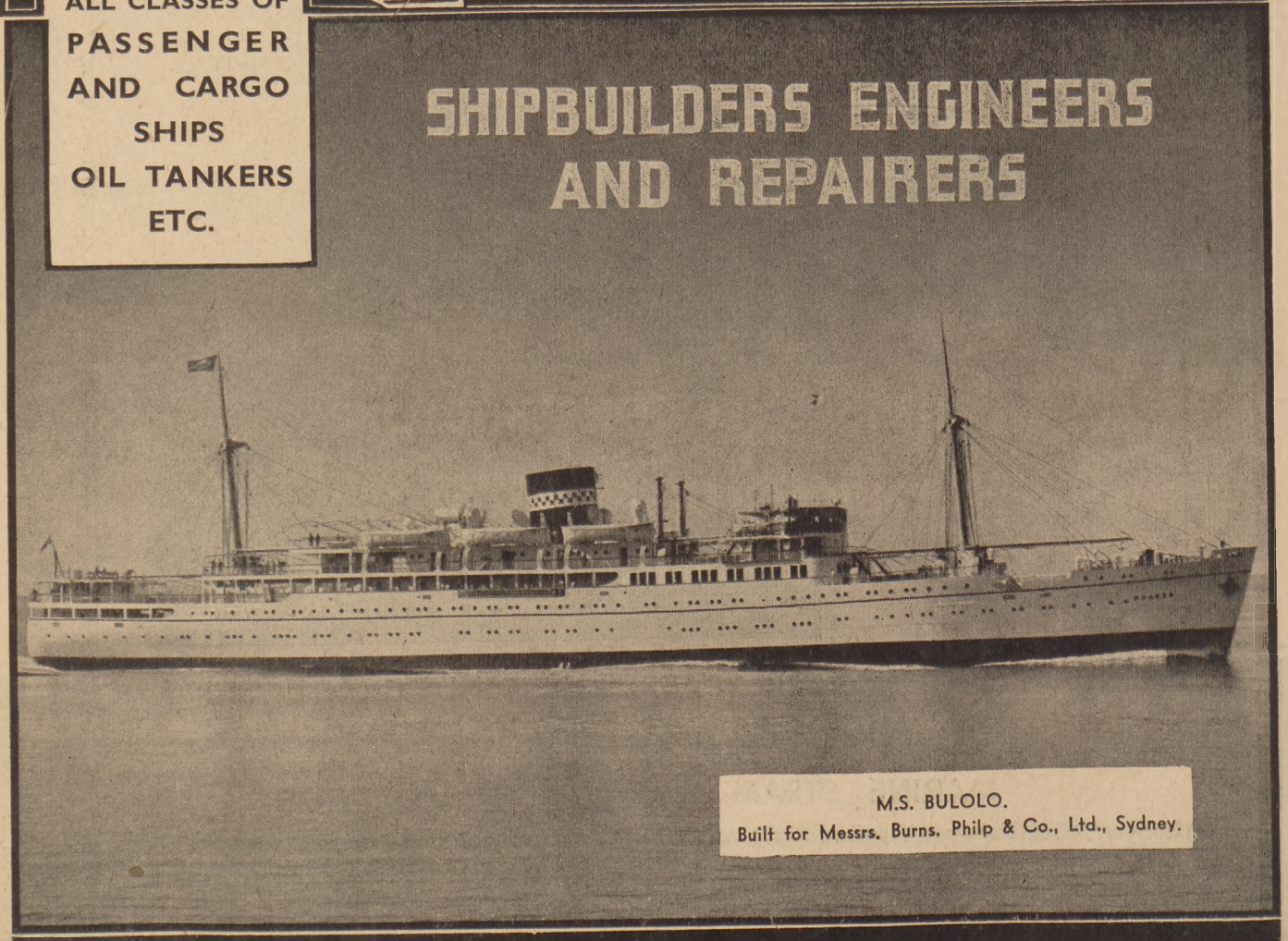

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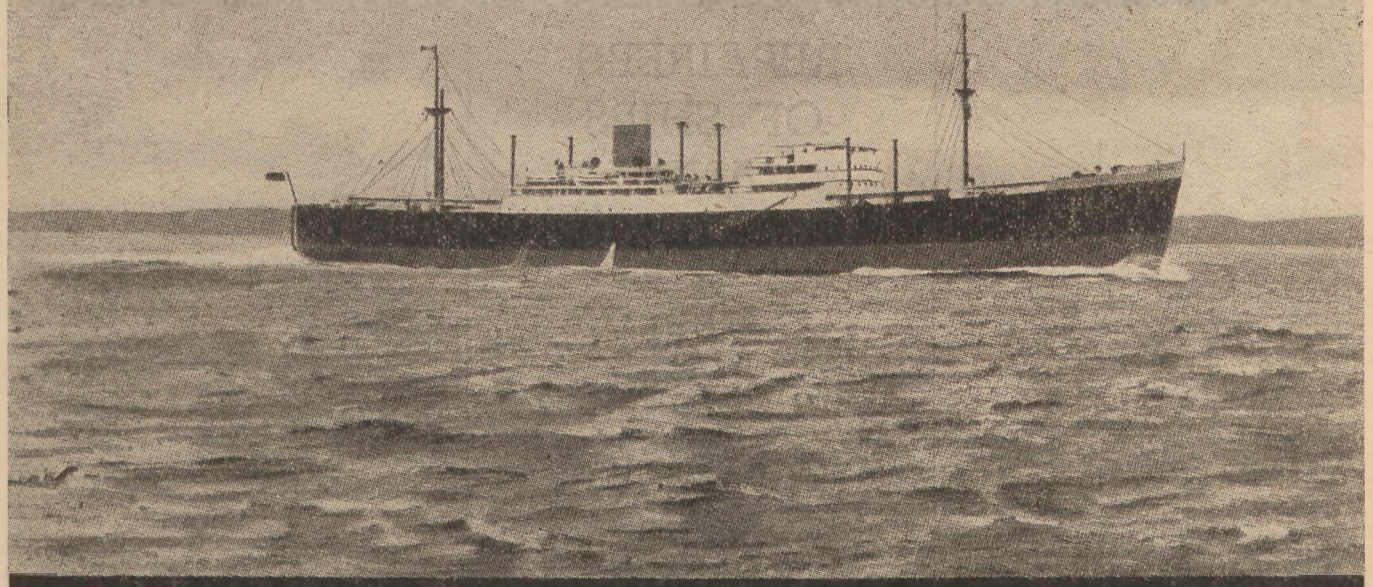

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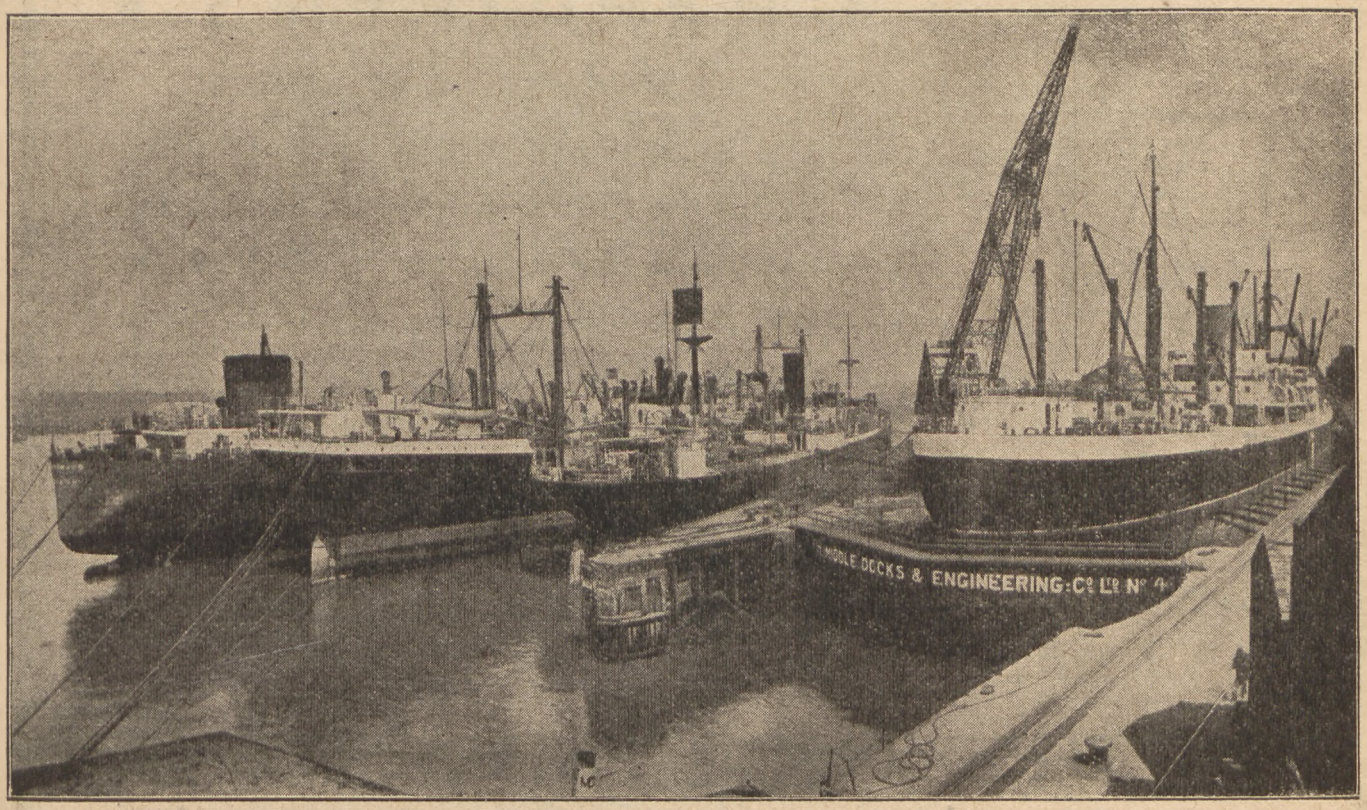

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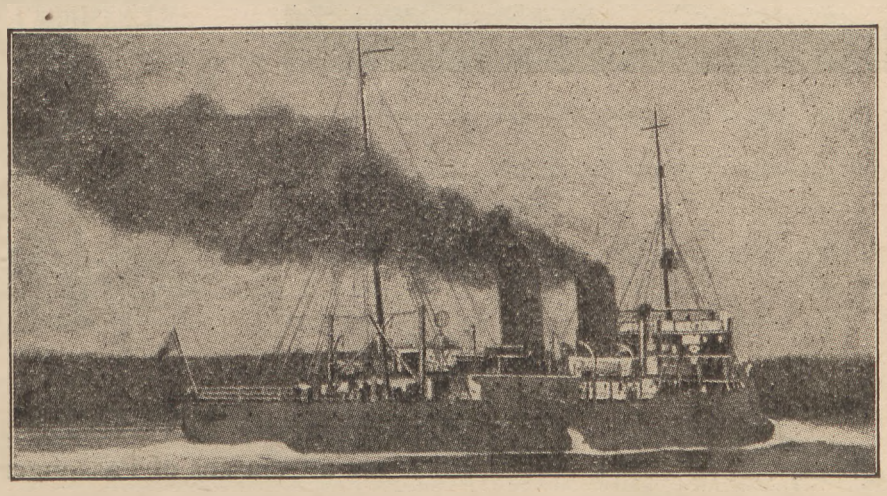

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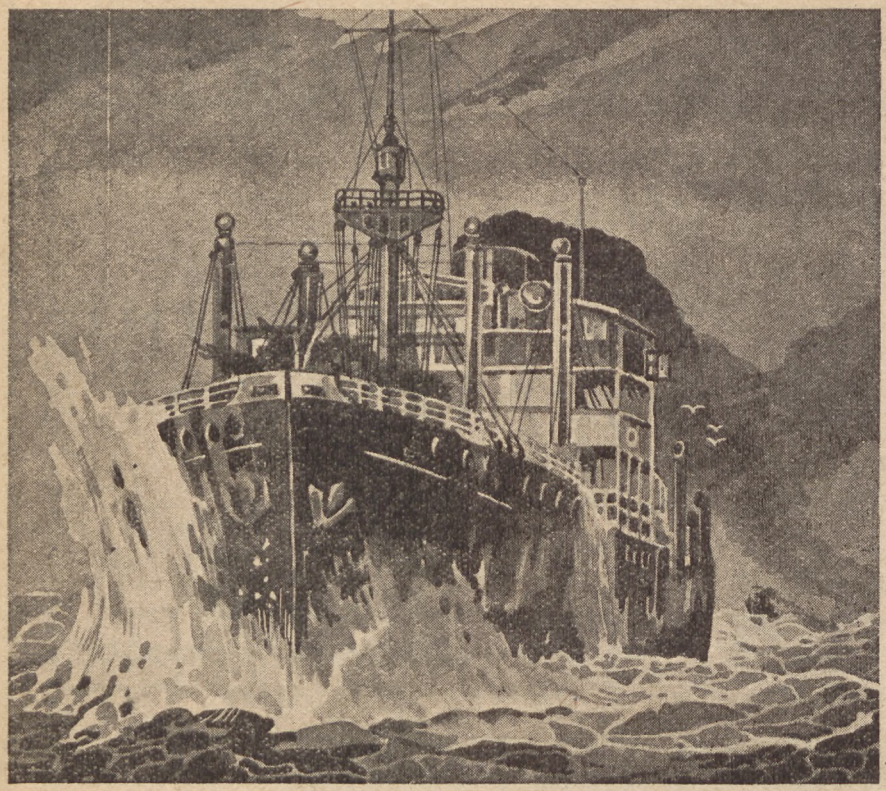

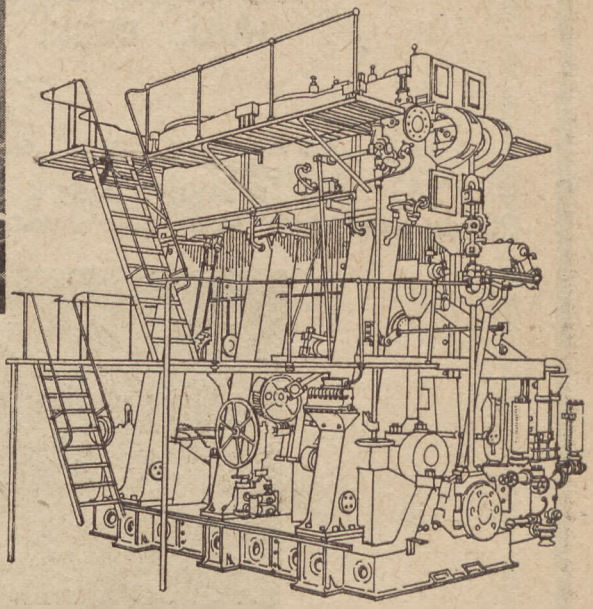

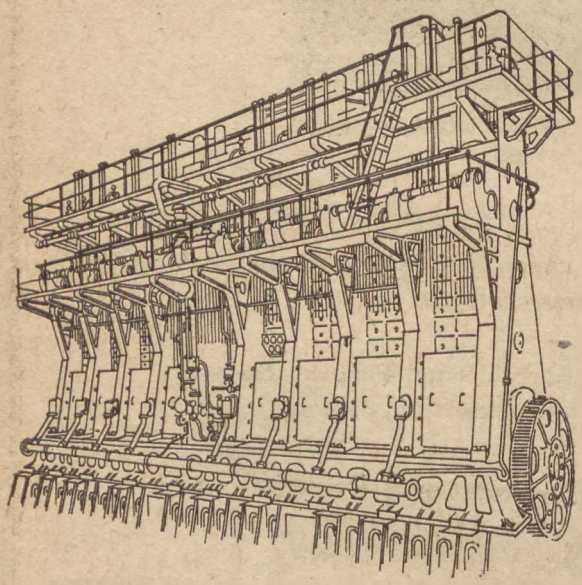

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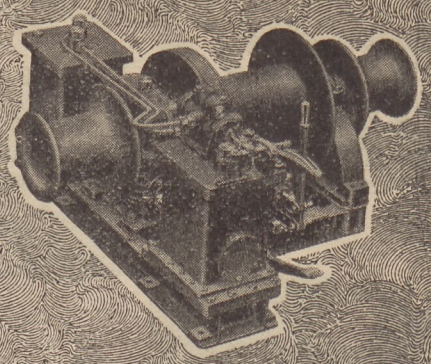

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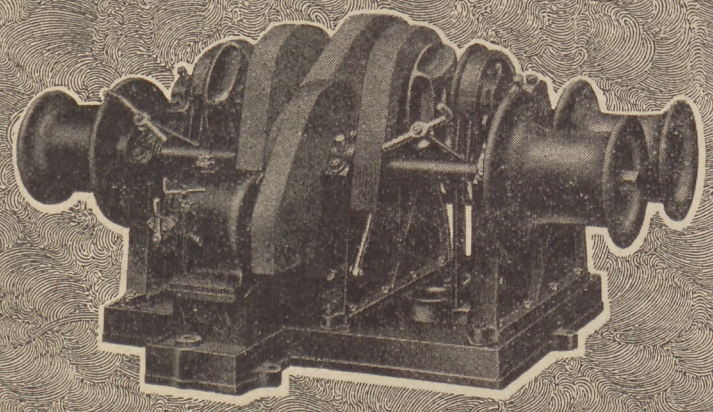

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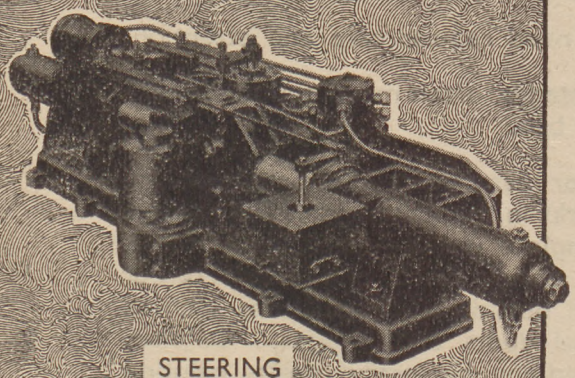

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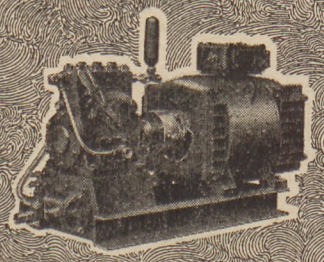

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of

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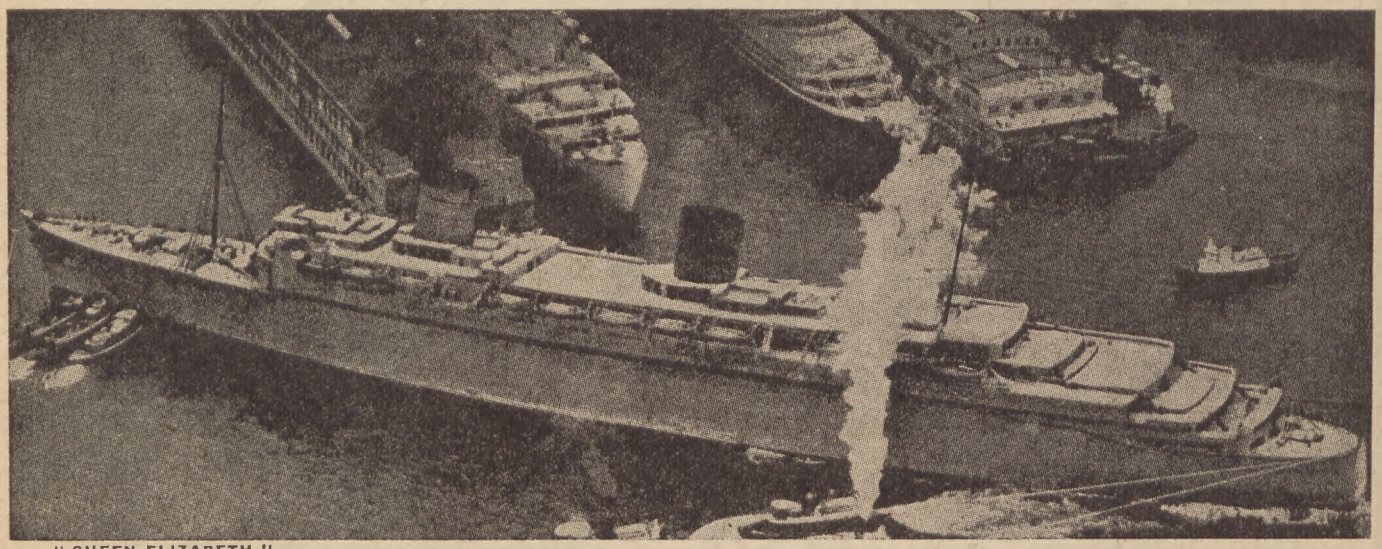

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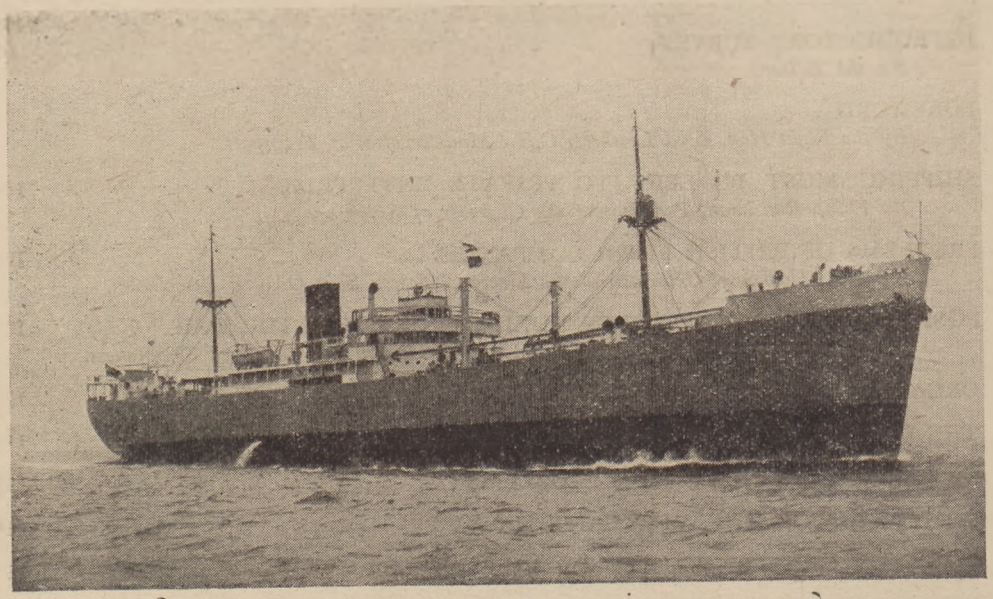

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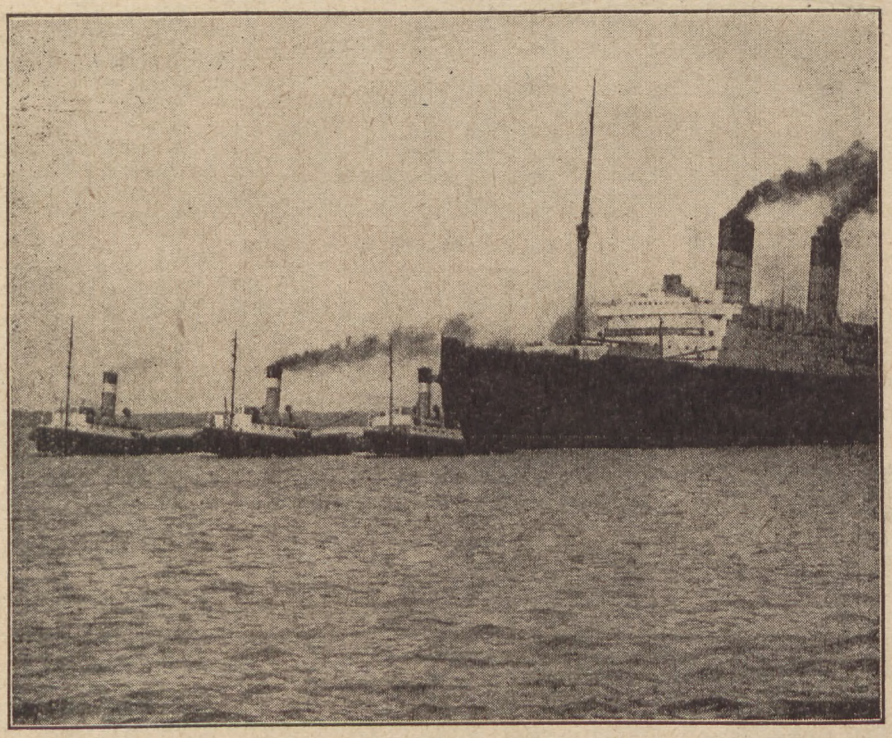

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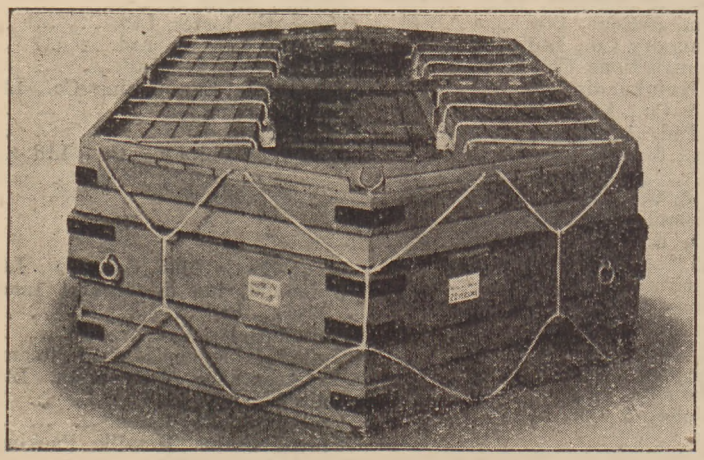
FOR 14-15-19-20 PERSONS



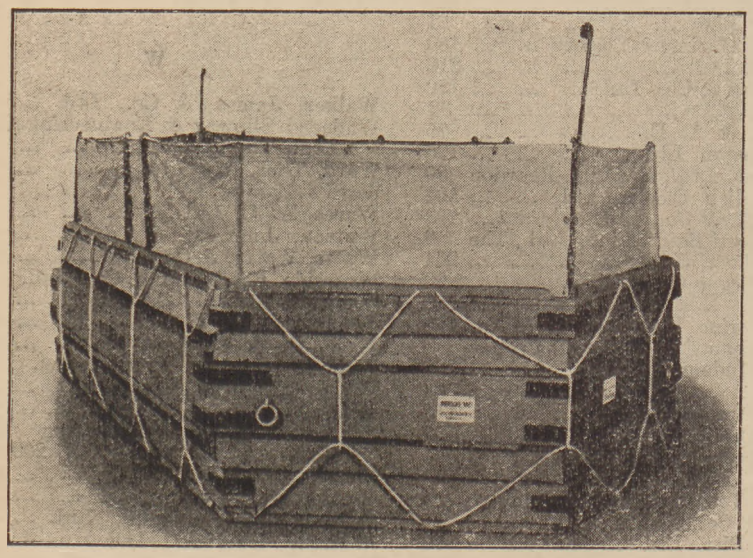
DIMENSIONS :

19—20 person : 15′ 10″ long x 8′ 6″ wide x 3′ 1″ deep, weight 24¾ cwts.
14—15 person : 13′ 9″ long x 7′ 11″ wide x 3′ 1″ deep, weight 19½ cwts.

(*These weights are exclusive of items of equipment, approx.* 3½ *cwts.*)

Strongly built and well finished. Coated internally with wood preservative and externally with Admiralty Grey Paint

NOTE.—18 inches seating space per person with comfortable leg room.



With "Harrocks" Side Screens, 2 feet high, secured on strong stanchions, deeply fixed into iron tube sockets and plates, and awning, overlapping side screens with ample headroom.

Screens and awning of Rot-proof Canvas, coloured bright orange.

Specification

Strongly built and well finished. Coated internally with wood preservative and externally with Admiralty grey paint.

MAIN FRAMES
11 in. x 2 in., fastened with ½ in. bolts.

BUOYANCY TANK FRAMING
5 in. x 2 in.

CORNERS AND BOWS
fitted with strong steel bolted Straps, as illustrated.

FLOOR, SIDES OF WELL, AND SEATING
6 in. x 1 in. close-boarded. Galvanised Steel Straps fixed over seats. All secured with strong screws.

WELL FLOOR
fitted with Oak or Elm foot-grips and floor-drained.

HANDGRIP LINES
on top and edges of seats.
NOTE.—Hardwood Chafing Strips fitted on outside edges of seats and bows as skids to clear handgrip lines when launching.

DOUBLE SET OF LIFELINES
all around raft.

LOCKER
In 19 and 20 person raft—10 ft. 6 in. long x 2 ft. 11½ in. wide x 10¾ in. deep, 24½ c. ft.
In 14 and 15 person raft—8 ft. 2 in. long x 2 ft. 5 in. wide x 10¾ in. deep, 18¼ c. ft.
Lids fitted with strong brass hinges and locking device.

BUOYANCY TANKS
In 20 person raft—8 in wings and 4 in bows.
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NOTE.—In 14 and 19 person raft, no bow tanks.
Constructed in 20-gauge Galvanised Steel Sheets, hook joints, coated externally with Bitumastic and filled with Kapok.

PROVISION TANKS
Two 22-gauge Galvanised Steel. each 2½ c. ft. capacity, 7 in. diam. screw covers with welded handles, brass seating and rubber jointing. Coated outside with Bitumastic. Fixed in seating.

PORTABLE FRESH WATER TANKS
of 22-gauge Galvanised Steel. Strong Handles top and bottom. Spouts for pouring with rubber-jointed brass screw-caps and chains. Coated internally with Rosbonite or other suitable composition, and externally with Bitumastic. Four in 15 person, five in 20 person raft. Fitted in seats.

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of rot-proof Canvas, 2 ft. high, secured on ¾ in. diameter stanchions fitted into deep iron sockets and plates.

AWNING
overlapping tops of side-screens. Fitted on long end-stanchions and wood struts fitted into cleats on sides of seats, giving ample head-room. Screens and Awning coloured bright orange. Screens and Awning in water-proof bag.

RING BOLTS, FOR TOWING AND SLINGING
One heavy Galvanised Ringbolt at each corner with long through-bolt and check nut on inside of timbers.

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One Ring Plate fixed in bow ends of well-deck, top and bottom, for Sea Anchor.

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INTRODUCTORY SURVEY

Sea Power of the United Nations—Britain's Maritime Industries in the Future

By The Editor

MILITARY achievements of the United Nations in North Africa, Russia and the South West Pacific in the closing months of last year provided a welcome contrast to the previous trend of events in the war on land; the onslaught of German and Japanese troops was not only checked but halted; the ability of the United Nations to mount offensives adequately provided with the weapons of modern war and, having mounted them, to inflict defeats upon the enemy forces that had previously overrun vast areas of the world's surface was proved.

These represent very real achievements which support the view that we of the United Nations have something more solid than faith on which to base our belief in ultimate victory. Yet there is no reason for over-confidence, and in a publication of this character which primarily concerns the shipping, shipbuilding and allied industries, it is right that Mr. J. R. Hobhouse should commence his article with a warning about the severity of the task that continues to confront the sea power of the United Nations and is being tackled with the courage, determination and tenacity that those who man our ships of war and commerce—though the dividing line is now fine indeed—have displayed since September, 1939.

Mr. Hobhouse writes with particular authority as chairman of the Liverpool Steam Ship Owners' Association and as chairman of the General Council of British Shipping, and he states very directly and bluntly that "throughout 1942 the war at sea has continued with unrelenting fury. Grievous losses have been and are being sustained and there is no room for complacency."

Not until victory is finally achieved can anyone — commander-in-chief, statesman, soldier or worker— afford to ignore the fact that upon the broad foundation of sea power rests the whole imposing fabric now represented by the war effort of the United Nations; that the attack upon shipping is as sustained and relentless as the enemy can make it; that upon that attack still rests Germany's main chance of averting the consequences of defeat.

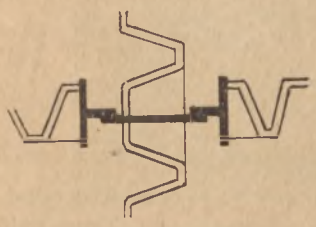
Hitler may not be a "sea animal"; he may be guided by his own intuitions in the manner in which he conducts warfare on land. But as far as war at sea is concerned there is every reason to believe that he relies on the opinion of experienced German naval officers who know how near to victory the submarine campaign took Imperial Germany in 1914-18. Hitler has made many threats about the severity of the war he would wage against the shipping of the United Nations. Inevitably, as he has sought in making them to sustain German morale, he has exaggerated the destruction he has prophesied but none of his threats have been unaccompanied by performance which is more than can be said of some of his prophecies about the course events would take on land. Quite clearly, he has concentrated his shipbuilding resources upon submarine construction, and, possessed as he is of a chain of bases covering nearly the whole coast of Europe—with a similar chain in the hands of Japan in the Far East—his intention has certainly been to succeed where the Imperial German Navy failed—but so nearly succeeded—in 1914-18.

It is probable that this intention to profit by past experience and ensure success in the war upon shipping was the primary reason for the invasion of Norway. He must have thought that possession of the Norwegian coastline, then the coasts of Denmark, Holland, Belgium and France—with those of Italy, Jugoslavia and Greece as well—and the efficient shipbuilding facilities of many of those countries would have enabled him to attack shipping on a scale that would be so heavy and widespread as to be almost unanswerable. His object has not been achieved—due to those who man and build the ships upon which we depend—but the intention remains. Hitler must be disappointed that so comprehensive a scheme of warfare at sea has not achieved the complete results for which he looked, but it must always be remembered that he knows it has inflicted heavy losses upon the shipping of the United Nations.

His views on propaganda—the greater the lie, the greater the chance of its acceptance—suggest that he will not have much faith in the claims made in respect of shipping losses in his own communiques, but even if he halves those claims, he knows he has inflicted grave losses, in addition to which he has the knowledge, supported by statements emanating from the United Nations, that not until recently has new construction kept pace with destruction. No wonder that he continues to rely on the campaign that has brought a great measure of success. Now, fortunately, his anxiety should be an increasing quantity as the full weight of U.S. and Canadian shipbuilding is brought in to redress the balance and to supplement the quantity of tonnage that this country has been able to put on the scales.

It is also well to remember that construction of sufficient merchant tonnage to equalise or surpass the amount lost is not of itself sufficient to defeat the menace of unceasing attack upon shipping. It means a struggle prolonged in character, a war of attrition in which the side with the larger supplies ultimately prevails but in a state of exhaustion. Destruction of the menace is complementary and is essential if victory is to be gained without debilitating delay. On that account, warships to pursue, damage and destroy submarines, aircraft to bring down the bombers which prey upon shipping are also needed in large numbers. Construction of the enemy's weapons can be impeded and hindered at its source by heavy attacks made by large forces of bombers, but that again is insufficient. It is also necessary to hunt down the submarines at sea and so put out of action their trained crews. Counter-measures against submarines must be aimed as much against their personnel as against the vessels themselves, for trained crews are probably harder to replace than damaged or sunken submarines, and there is the

MODERN DEVELOPMENTS IN SHIP CONSTRUCTION



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evidence of the last war to prove that the morale of submarine crews can be affected to the point of refusal of duty by the cumulative effect of remorseless attack, creating fears and uncertainties as vessels fail to return for causes familiar in general principle but not known in precise detail.

Therefore it may be said that in this one direction only, the measures to be taken against submarines, the weapons to be employed, are indivisible, as indeed the whole course of the war has shown to date. It is not a question of the submarine menace being a job for the Air Force of the United Nations to the exclusion of their Navies or *vice versa*; the efforts of both, combined and co-ordinated, are needed, and as the resources of both grow so will the measure of success grow.

In this connection, Admiral Sir Herbert Richmond has recently pointed out some of the misconceptions which seem to exist about the meaning of sea power. As used by Mahan, who brought the term into use expressly to differentiate it from "naval" power, it is the power of exercising the control of the sea and as such is not dependent solely on surface ships or submarines or now on aircraft. "It is," Sir Herbert Richmond has written, "a power composed of an amalgam of all types of fighting instruments that are capable of taking part in the operations of sea warfare; of bases without which those fighting instruments cannot work; and of shipping without which use cannot be made of the command of the sea other than in blockade and defence against invasion."

The fighting instruments by means of which the object of sea power—control of the sea—is directly attained are not surface ships only. They include submarines and aircraft, and Sir Herbert Richmond has quoted President Roosevelt as correctly speaking of a navy as being composed of "ships that sail on the surface of the sea, ships that move under the surface and ships that move through the air."

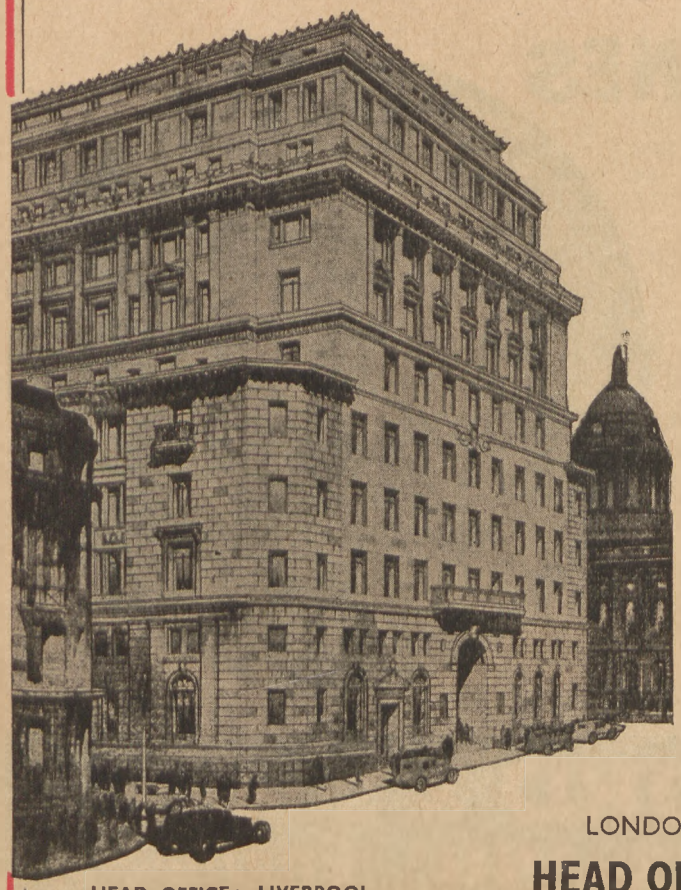
To the importance of our shipping, without which use cannot be made of the command of the sea, the pages of this ANNUAL REVIEW bear witness, for they are concerned with the manner in which shipping and allied industries, having turned their energies from peace to war, have continued to make on an increasing scale their vital contributions to the success of the United Nations.

While the ANNUAL REVIEW is primarily and proudly concerned with British activities, it is our privilege on this occasion to include a representative symposium that depicts the extent of the contribution made by allied countries to the Merchant Navy Power of the United Nations. These various articles and the message from the Soviet Ambassador constitute an effective reminder that much is owed to the men of other nationalities, particularly those who carry on the fight at sea though their countries have been overrun by the enemy and many of them are cut off from their families—some even from all news of them. The spirit and fortitude of such men will not be crushed or broken by the excesses of Nazi Germany; knowledge of what they are doing is a stimulant to the cause of the United Nations, apart from the material aspect.

THOSE WHO MAN THE SHIPS

A companion message from the British point of view is that by the Minister of War Transport, Lord Leathers, and the contents of the issue combine to present an effective picture of the maritime strength of the United Nations, which, supported by the growing might of Navies, Armies and Air Forces, will inexorably bring down the Axis to defeat.

Of those who man the merchant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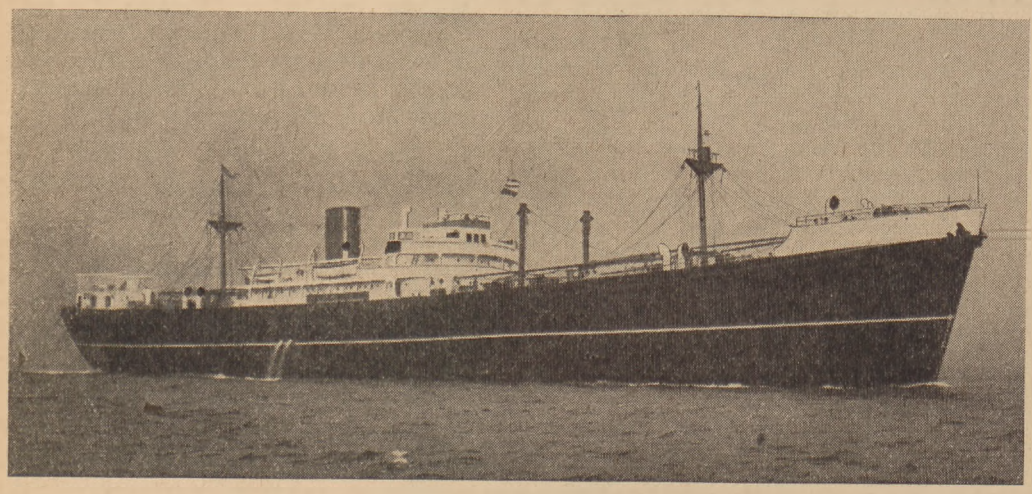

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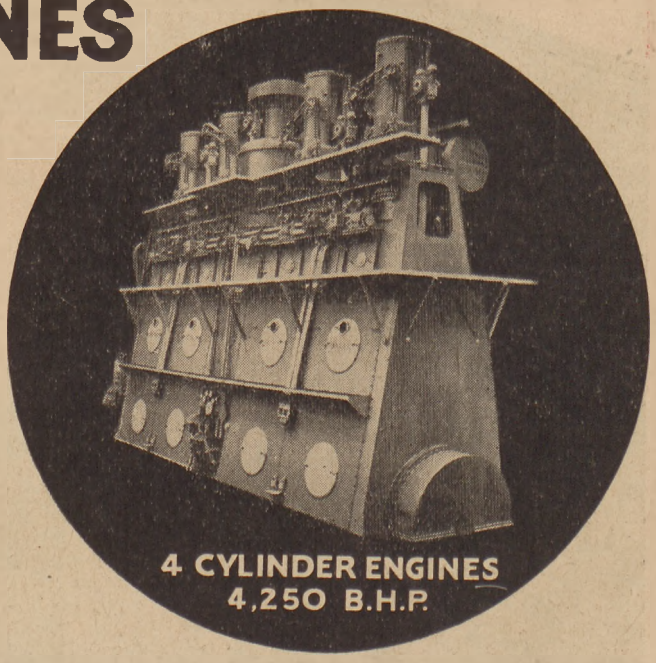

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ships of the United Nations it is hardly possible to write too highly. Their campaign has been without pause or interval, and for over three years they have stubbornly and successfully met every ingenuity in sea warfare that the enemy could devise to prevent ships from sailing the seas in sufficient numbers to keep supplied the bases and fighting fronts of the United Nations.

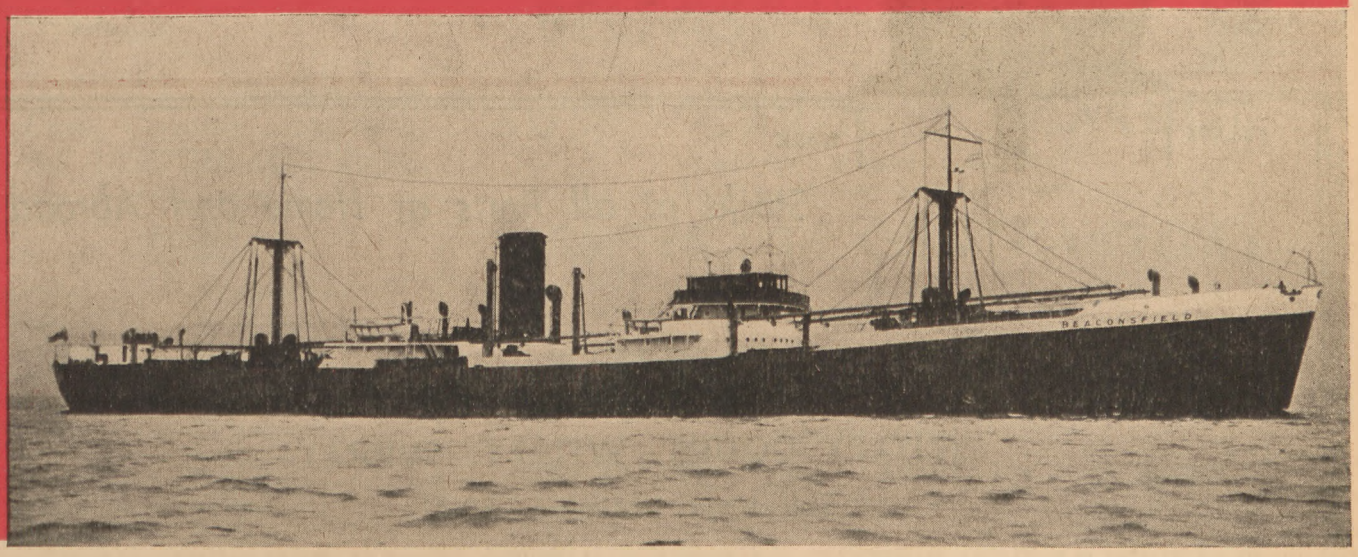
Much in the public eye have been the accounts of the way in which convoys have been fought through to Russia and Malta, and in September the announcement was welcomed that the King had approved the addition of the Distinguished Service Order, the Conspicuous Gallantry Medal and the Distinguished Service Medal to the list of decorations open for award in the Merchant Navy. At the same time, it was announced that the George Cross had been awarded to Captain Dudley William Mason, who was in command of the tanker *Ohio* when she was taken through to Malta in convoy despite heavy damage by enemy aircraft and submarines.

Restriction of the awards open to the Merchant Navy in the past had in no way been due to lack of appreciation of the truly meritorious conduct shown in this war and the last by its officers and men, but to the fact that the Merchant Navy was not regarded as a combatant force, except for defence, and did not accordingly come in the same category for the conferment of awards as what have been known as the fighting services, the Royal Navy and Royal Marines, the Army, and the Royal Air Force. The vicious and sustained attack the enemy has made since the day war broke out upon the merchant shipping of this country has swept this distinction away, and the King's decision meant in effect, that the Merchant Navy, of which his Majesty is the Master, took its rightful place as the Fourth Fighting Service of the nation and Empire. There was some grim satisfaction in the knowledge that nothing the enemy could attempt against the Merchant Navy by way of "retaliation" against its change of character from a civilian to a combatant force could be worse than the loss, damage and suffering he had already sought to inflict upon it, in the vain hope of preventing our ships from sailing to and from our shores.

Since the war began, and particularly when taking much-needed supplies to Malta and to Russia—both involving voyages of extreme hazard—the men of the Merchant Navy have been called upon to face unprecedented perils and dangers. Their ships, rather than the warships escorting them, have been singled out for attack, and they have not the same weapons for hitting back as have the men in the warships. Their position is no less perilous than that of their "opposite numbers" in the Royal Navy, who are primarily trained for warfare, and are given all the weapons for offence and defence that science and ingenuity can devise.

This essential equality of service has now been recognised, and there is no award, including the highest, which is not open to the Merchant Navy, for the Victoria Cross can be bestowed on a civilian regularly or temporarily under the orders, direction or supervision of the naval, military or air forces of the Empire. Thus a new significance attaches to those initials "M.N." which are to be seen on so many badges in the lapels of jackets in our seaport towns. It is for the people of this country, too, to follow the example of their King by doing such honour as lies in their power to officers and ratings, M.N.—the Fourth Fighting Service in Freedom's cause.

THE PATH OF PROGRESS



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If we wish to repay them for their devotion there is one way in which this can be accomplished. Both officers and men have one fear in common. Those in close touch with our seagoing personnel know that the majority are apprehensive of the future. They wonder whether, after the war is over, they will experience the same neglect as was their portion after the last war, when, soon after a short-lived boom in shipping, officers and men were walking the streets vainly seeking employment.

If the British people wish to recognise the debt they owe to the men of the Merchant Navy they can repay it by making sure that never again shall such a fate befall our shipping industry. It is the Government's present intention to see that accommodation and conditions of employment at sea shall be worthy of those who have done so much in the service of the nation, and that the Merchant Navy shall be maintained in a state of efficiency. That pledge must be kept.

We are a nation of islanders. We live by the sea, importing from other lands the raw materials of industry and the produce to feed our population and exporting the finished articles manufactured in our workshops. Well-managed and well-manned ships are necessary for our existence and to maintain the standard of living to which our people have been accustomed. Our shipping industry must be made prosperous in order that adequate remuneration and security of employment shall be assured. It must be encouraged, not hindered. If the shipping industry is given a square deal such conditions will be obtained.

It is incumbent upon the British public to bear that in mind when the terrors of war are forgotten. It is the prerogative of the King to make appointments and confer awards but the public also have their opportunity in this direction, and King and people can acknowledge in different ways the services the Merchant Navy is rendering. Its officers and men will appreciate wider public interest in their future welfare no less than the awards the King confers upon them. Royal distinctions and public interest are, or should be, complementary as the public has a duty to discharge to those whom the King has honoured.

Those Who Build the Ships

It is also fitting here to write of those who build the ships. The vast majority of them have done an excellent job of work, in the words of the Select Committee on National Expenditure, and it is unfortunate that there has been a tendency in criticisms of the few to apply them also to the many.

At Newcastle in October, Mr. J. Ramsay Gebbie, in his presidential address at the annual meeting of the North East Coast Institution of Engineers and Shipbuilders, dealt with some of these criticisms, not altogether as a professional man talking to experts, but with the object of giving facts that would be understood by outsiders and by those critics who were so free with their uninformed criticism.

For instance, he observed that comparisons had been made between the work done by the shipyards of this country and those of America. The workers in the U.S. shipyards have done much magnificent work, but the conditions there and in this country are not at all comparable. They had plenty of labour, in the beginning, to take advantage of the welding process, they have no blackout, they are able to work a three-shift system, allowing them to concentrate an average of 2,000 men (at times 4,000) on each berth, compared with our 200. But we have reached the target we have set ourselves, for practically

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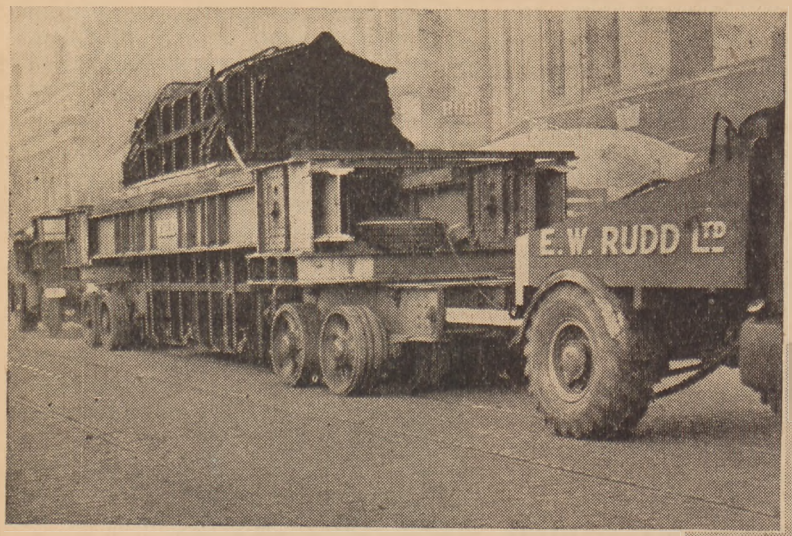

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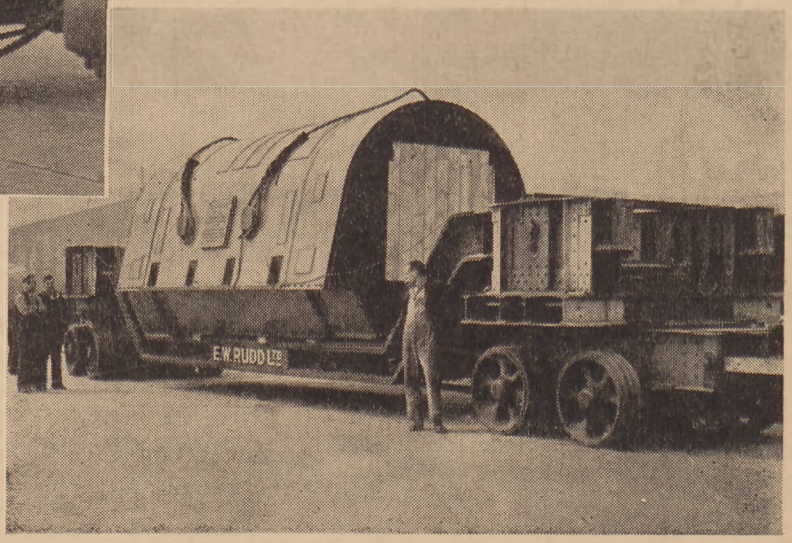
Transport of a Transformer weighing 75 ton nett, 100 ton gross.



Transport of Alternator weighing 85 ton nett, 135 ton gross.

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every shipyard Mr. Gebbie knows has broken its past record, despite all these handicaps, another of which is the restriction of transport facilities.

Another matter in the minds of the critics is the speed of the new ships that are being built. They have said the builders should have gone in for speedier vessels, forgetful of the fact that the responsibility lay with the Government who placed the orders. But if all the new ships were designed for greater speed, one result would be that there would be fewer ships, for the fast vessels would take a longer time to build and would carry smaller cargoes. Mr. Gebbie could not give the true facts, but there is evidence that the programme of fast ships is not so meagre as the critics would have us think. It certainly is restricted by the labour problem. The critics would also find that in regard to the normal methods of building ships the British yards are well ahead in comparison with the best of any kind of layout. The criticism in regard to the building of standard ships is answered by the fact that each yard concentrates on its own particular standard type, which is better than having one standard for all.

The meeting at which Mr. Gebbie gave his address was attended by Sir Amos L. Ayre, Deputy-Controller of Merchant Shipping and Repairs, and Director of Merchant Shipbuilding, who received the honorary fellowship of the Institution. Acknowledging the honour, and speaking of the future of shipbuilding in this country, he said he was unable to believe that any Government would again allow the shipbuilding industry, with marine engineering and shiprepairing, of course, to approach the condition of extinction which, despite the warnings of the industry, was almost reached in the pre-war period. Given a reasonable stability, the industry can hope to rise higher. Its structure must be examined to remove every semblance of inefficiency. Education must be reformed, and must be of a form that the student is properly prepared for the hurly-burly of industry, and will be keen to enter it and strive for the big places and leadership.

Dealing with the progress of shipbuilding here and abroad, Sir Amos characterised the war efforts of Canada and the United States as really magnificent. It would appear to be a far cry from work on a concrete dam to steel shipbuilding, he observed, and the fact gave much food for thought. But men and women, after only a few weeks of training, were doing a good job on important structural welding. Although the methods required a large amount of labour, and could not therefore be introduced into this country at present, there is much to be learned from them.

Mr. Oliver Lyttelton's statement in the House of Commons in December about the combined production of British and U.S. yards this year enables what must be assumed to be a reasonably accurate estimate of British capacity to be made, and if that estimate does nothing else, it should serve finally to put an end to uninformed criticism of those who are responsible for merchant shipbuilding in this country and those who carry out the actual construction in the shipyards and engine shops.

The American "target" for 1942-43 is a known quantity. It has been progressively stepped-up by President Roosevelt's "directives" from 12,000,000 to 18,000,000 to 24,000,000 deadweight tons; of the final figure, the scheduled output last year was 8,000,000 tons, leaving double that quantity to be produced this year. Mr. Lyttelton said that the programmes of Great Britain and the United States would "substantially exceed 20 million tons deadweight in 1943," and,

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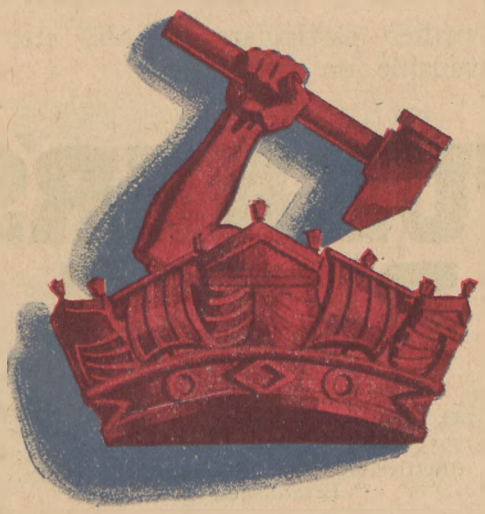

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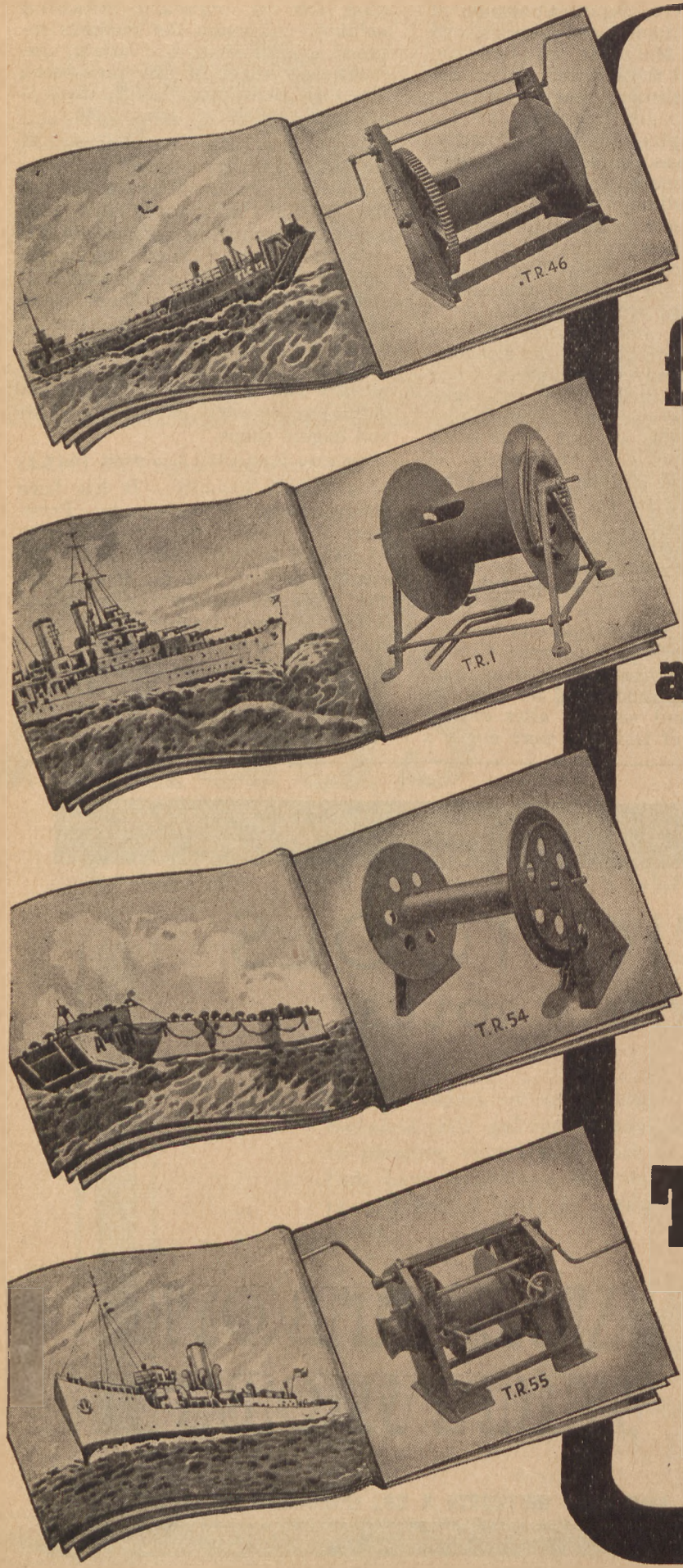

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using the conversion formula given by the First Lord of the Admiralty in a recent speech in London, that represents a gross tonnage in excess of 13,000,000, rising, perhaps, to nearly the figure of 14,000,000 tons gross which was mentioned by Mr. Lyttelton as being an approximate equivalent.

Taking, however, the lower figure, particularly as it has been stated in the United States that 16,000,000 tons deadweight does not represent the maximum attainable provided steel supplies are adequate, we have a figure of some 4,000,000 tons deadweight, or over 2,500,000 tons gross as the British contribution, and it seems clear from the reference Mr. Lyttelton made to "the merchant shipbuilding programmes in the United States and this country," that he was not bringing into the account the resources of the Empire, which, notably in Canada, have been greatly expanded. The figures Mr. Lyttelton has given thus confirm that the output from British yards surpasses that of the last war, and this is a real achievement, having regard to the conditions under which the shipbuilding industry has been carried out, the smaller labour force, the fewer berths and the restrictions imposed by the blackout.

In the 11th Andrew Laing Lecture, read before the North East Coast Institution of Engineers and Shipbuilders, Messrs. R. C. Thompson and H. Hunter were able to state that the man-hours required in the United States to build ships of similar design are about double the number required in this country, adding that "great credit has accordingly been paid to our shipyard workers." Mr. Lyttelton's figures provide the measure by which their work can be more definitely assessed, and enable us to appreciate how truly the Select Committee on National Expenditure commented in their 17th report, issued in November, when they recorded their general impression that "in merchant shipbuilding and repairs an excellent job has been done." The industry has deserved that praise, and although much will probably be written in the future about British shipbuilding during the war, there may be no better verdict, for brevity and point, than those few words —an excellent job has been done.

The Andrew Laing Lecture, entitled "The British Merchant Shipbuilding Programme in North America," is, in itself, one of the most important contributions to technical literature since the war started. It is a frank clearing up of misconception and a most important expose of the type, size, shape, power and propelling machinery of our own Ocean type ships, and the American Liberty ships. It tells more in brief succinct phrases of American shipbuilding methods, and the way in which men like Mr. Henry J. Kaiser have adapted themselves to the requirements of war, than anything which has yet appeared in print. The joint authors, Messrs. Thompson and Hunter, were respectively head and marine engineer member of the technical mission sent from this country to North America at the end of 1940 to arrange for the construction of the merchant ships for British account in U.S. and Canadian yards.

In this country, it has been said that because we do not adopt Kaiser methods we are behind the times, and our shipbuilding effort is old-fashioned. In the United States people have said that because we cannot launch a ship in under five days from keel laying as Mr. Kaiser has done, we are not putting our back into the work. In plain unvarnished technical terms, capable of wide interpretation to the general public, Messrs. Thompson and Hunter told the story of their search,

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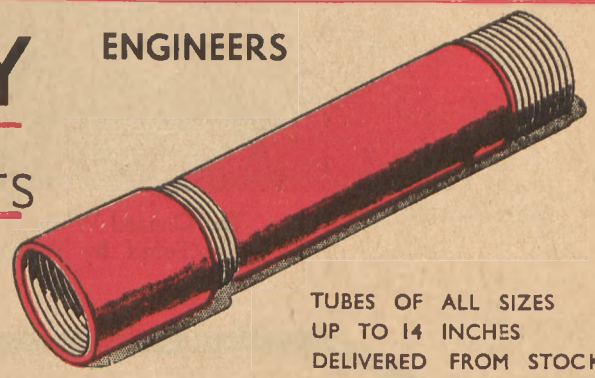

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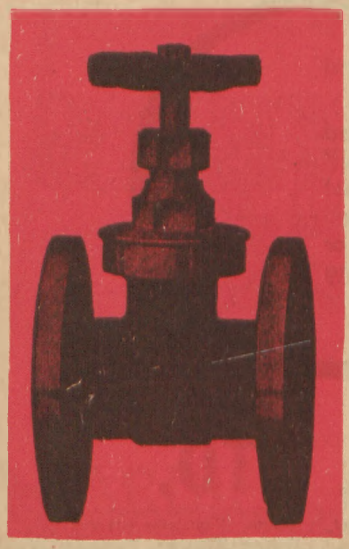

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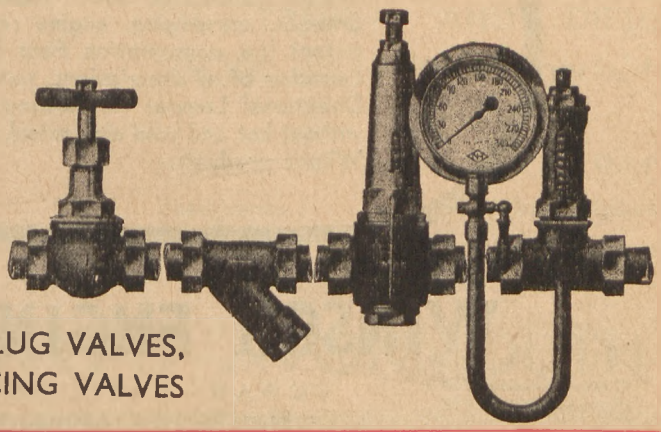

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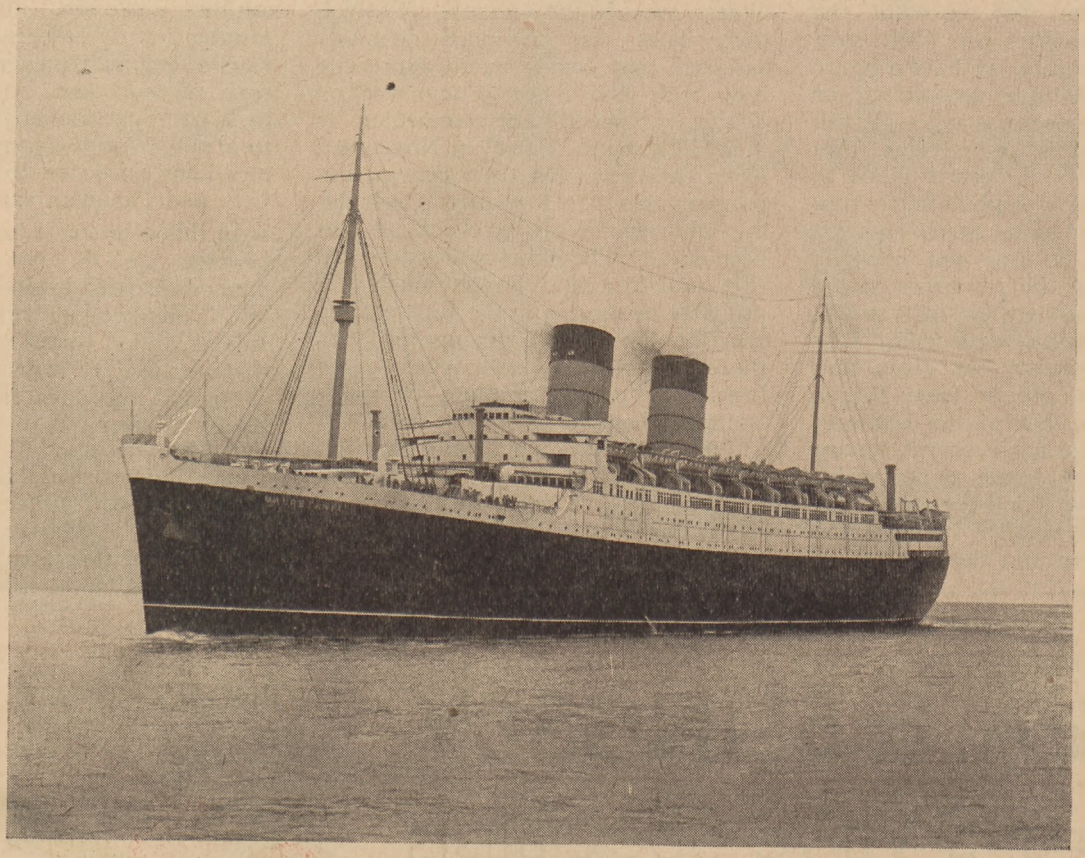

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the development of their design, and the final production of the Ocean ships.

Ships were built in both the United States and Canada. The Kaiser group in America had entirely new shipyards, but in Canada contracts were with existing yards. Riveting was feasible and preferred by the Canadian builder. The new U.S. yards preferred welding. As the authors pointed out, the arguments in favour of welding versus riveting are far from being settled, and although the former is put forward as being the modern method, all evidences show that it involves more labour in the building of ships.

Its advantages are that less capital cost is involved if a new shipyard is being laid down, and welding equipment is more readily available. Furthermore, the welding system adopted in the American mass-production ship factories has the supreme advantage that unskilled labour can be imported and readily trained. In both the United States and Canada labour was available in quantities. There were 12 million unemployed in the United States at the beginning of the war, having a high average of intelligence, a mechanical aptitude with a large proportion of skilled craftsmen amongst them, although practically none had previous shipbuilding experience.

The yards were laid out for and engaged on repetition of identical ships in quantity, so that men were largely on the same job time after time, an essential to the efficient and quick utilisation of raw labour. With this went an elaborate system of production planning, including very complete breakdown of the plans into component detail.

Welding Progress

The use of welding for ship construction and shiprepairing has made such tremendous progress during the past two years that all connected with the shipbuilding industry are taking the greatest interest not only in what has so far been accomplished, but in possible future developments. It is, therefore, believed that the symposium of articles in this issue contributed by manufacturers of hand and automatic welding machines and electrodes, explaining their use, will not only prove of interest, but of assistance to those who are examining the possibilities of further extension in the application of welding in the shipbuilding and shiprepairing establishments of Britain. We are particularly indebted to Dr. James Montgomerie, Chief Ship Surveyor of Lloyd's Register of Shipping, for his introductory review of welding developments.

There can be no question that the great shipbuilding drive in the United States, where welding is employed to a wider extent than in this country, has served to attract attention to this method of ship construction. The experience which has been gained in America has not been without effect on shipbuilding practice in Britain, and, although the opportunities for using welding in British yards are not so great as in the United States, it has, nevertheless, been extended and is increasingly being used.

Before the war electric welding had, perhaps, made more considerable advances in America than elsewhere, although, as Mr. Norman Hunter recently pointed out, "welding for shipbuilding construction was developed in this country, and the latest practices in America are, after all their trials, now coming to our methods." Both in the United States and in Britain welded construction has increased during the war period. There are many reasons why progress has been more rapid in the United States. When the British Government, through the British Purchasing Commission, arranged for the construction of 60

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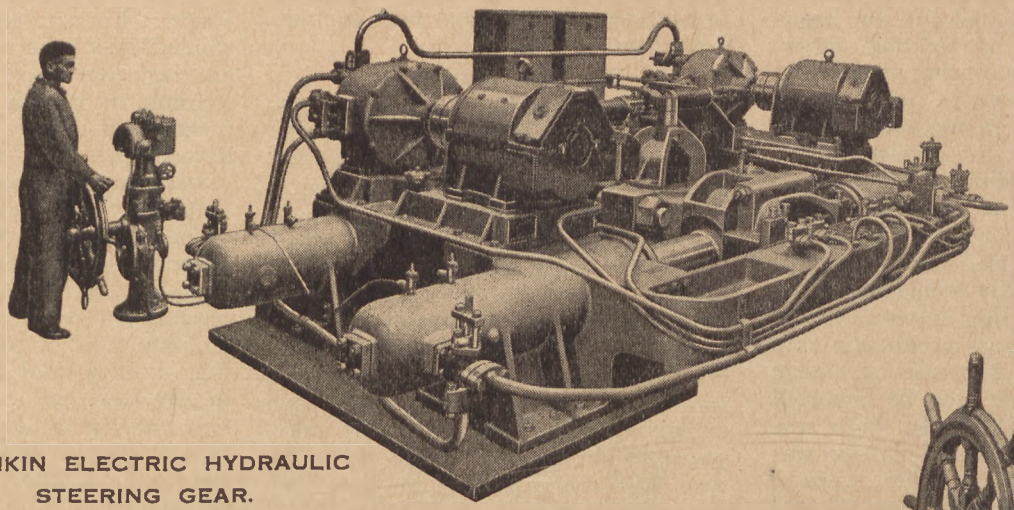

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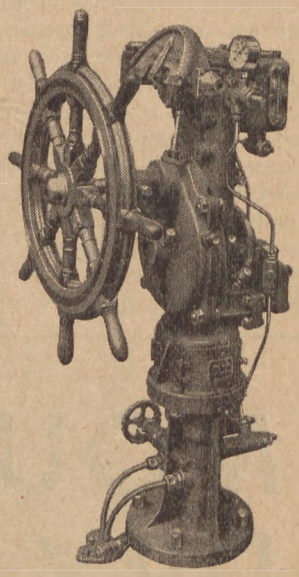

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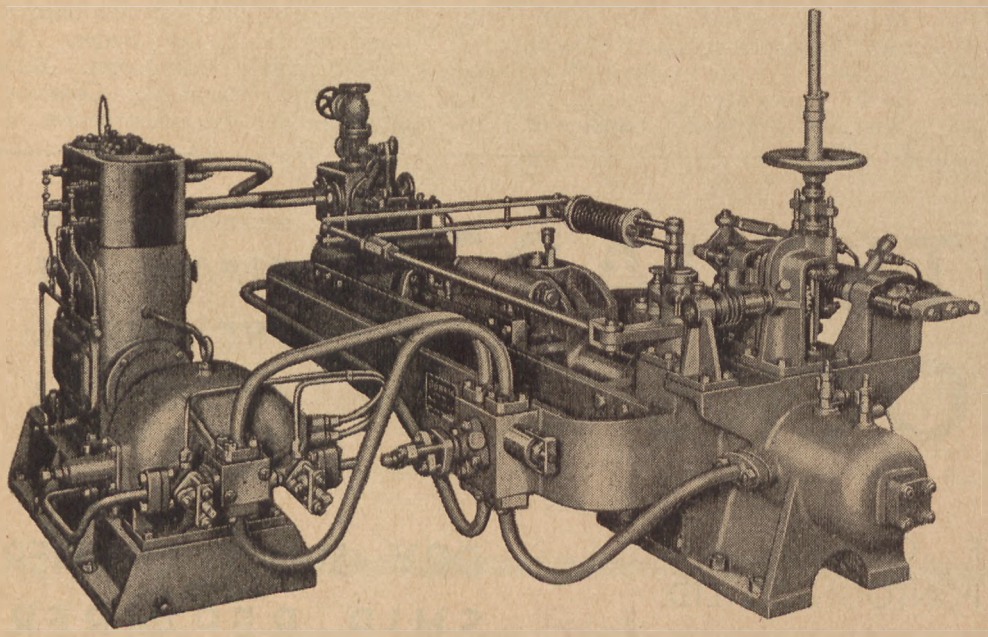

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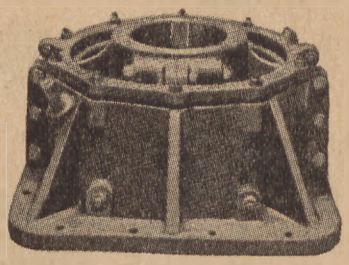

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cargo-carrying ships in America, necessitating the building and equipping of two new shipyards, there was only a limited supply of riveters and similar skilled shipyard tradesmen available in the United States. Then, when America entered the war, President Roosevelt called upon U.S. shipbuilders for the huge programme of new construction amounting to some 8,000,000 tons deadweight of new ships last year and 16,000,000 tons in 1943. Recognising the shortage of riveters, the British Admiralty arranged that, since electric welders could be trained much more quickly than riveters, the 60 British ships should be all-welded, and this practice has been followed in the construction of the hundreds of Liberty ships which are now leaving the berths at the rate of three or four a day in the United States.

In his presidential address, mentioned above, Mr. J. Ramsay Gebbie also made reference to this decision to build welded ships. It was, he said, a bold decision, and, fortunately for us, it had proved to have been a sound one, as the American welded ships now sailing the seas were good and reliable vessels; but Mr. Gebbie wished to emphasise that the one and only reason for the American ships being welded instead of riveted was that welding labour was available, or could be quickly made available, while riveting labour was not obtainable.

To listen to the clamour from the uninitiated for welded ships to be built in this country, he continued, one would think that the welded ship, *per se,* could be built in half, or less than half, the time that it took to build the ordinary riveted vessel; but this was definitely not so, and the reasons which allowed of the Americans launching a ship in less time than we could do were peculiar to the existing conditions.

There are various opinions regarding the length of time which is required to train a skilled riveter, but there is no doubt that a welder can be given sufficient training to perform many of the tasks required in ship construction in about six weeks. The labour supplies available in the United States when the large shipbuilding programmes were being initiated prompted the decision to build welded ships—not necessarily because it was considered that the welded vessel was a better proposition than a riveted ship.

It must, however, be admitted that many American shipowners hold decided views on this question, and Commander R. C. Lee, the vice-president of the Moore-McCormack Line, when on a visit to this country to attend a meeting of the International Maritime Conference last year, told a representative of *The Journal of Commerce and Shipping Telegraph,* that, for his part, he was so satisfied with the performance of welded ships, he would never again build a riveted ship.

That the welded ship is as strong as the riveted ship has been proved many times during the present war. In this connection it may be recalled that Sir Leighton Seager, the Cardiff shipowner, whose firm were appointed managers for the Ministry of War Transport of the first of the 60 ships built in the United States for Britain, the *Ocean Vanguard,* said in an interview that when this ship was in collision while on her maiden voyage the impact was severe. Sir Leighton stated that if she had been a vessel of ordinary construction the landings and butts would have failed and forward compartments would have filled with water. Riveting of internals would also have failed. No welding was started despite severe distortion of steelwork. The only water which entered the vessel was via actual holing of one plate (by an anchor fluke) and by loosened frame rivets.

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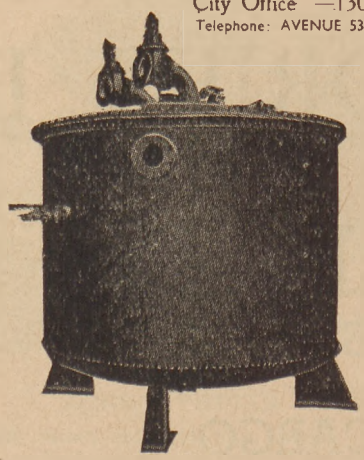

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Sir Leighton said that a riveted joint even of the best design could only express a percentage strength of solid plate strength, but a welded joint properly made seemed to be practically the same strength as solid plate. For instance, the thwartship welds of deck plates in the American-built ships were continuous over the width of the ship; the confidence of the designers was such that they disregarded the conventional " shift of butts " usual with the riveted type of vessel which were necessary to distribute the weakening due to the type of joint.

Again, many tankers built just previous to the war in America as well as in Britain, were, if not entirely welded, at least partially-welded so far as the hull was concerned; and this type of vessel has stood up well not only to the severest weather conditions but to war damage. Many a tanker has been able to reach port after having been torpedoed and after receiving damage which would probably have meant the loss of a riveted ship; and although the full credit for this may not be entirely due to the welded construction — the greater sub-division which is required in oil-carrying ships may be a contributory factor—nevertheless the use of welding makes for greater strength. It may be remembered that the *Ohio,* the American-built ship which received a severe battering whilst on convoy to Malta, was a welded ship, and there is no doubt that her welded construction enabled her to stand up to an ordeal which would have sunk a less strongly-built ship.

In war-time economic considerations go by the board. Ships are urgently needed and if a ship can be built quicker by more expensive methods the extra cost is well worth while. With plenty of unskilled labour available and a shortage of skilled riveters it is obvious that the adoption of welding will " deliver the goods " much more quickly than if the ships are built by ordinary methods. This has been proved in the United States. The same methods cannot be adopted in this country. It would be necessary to construct new shipyards if welding were to be used to the same extent as in the United States.

It has been pointed out that in many British shipyards there is probably not the space for developing all-welded construction for large ships; moreover, such reorganisation and re-equipping as is necessary would delay production by ordinary methods during the present vital period. It would appear necessary to build entirely new yards comprising large welding shops, marshalling yards for large masses of welded construction, and provided with cranes up to 50 tons capacity as well as slipways to start anew on all-welded construction. It is, however, suggested that present yards could be reorganised and equipped with new plant to introduce welding wherever possible to assist in speeding up production.

This does not mean that the fullest possible use is not being made of welding when it is advantageous to do so. During the war tankers have been built with the hulls welded fore and aft and only the midship section riveted but, in the main, riveting is employed for hull construction. As and when additional labour becomes available in Britain for work in the shipyards, it may be possible to extend further the use of welding. It is even believed that some British ships are being re-designed in order that yards which existed before the war, as well as some of those which have been re-opened since September, 1939, may go over in part or wholly to welding.

It is difficult to prophesy as to the future. Certainly by the time the war is over a great amount of data regarding the welded ship in service will be available to assist shipowners and shipbuilders in coming to

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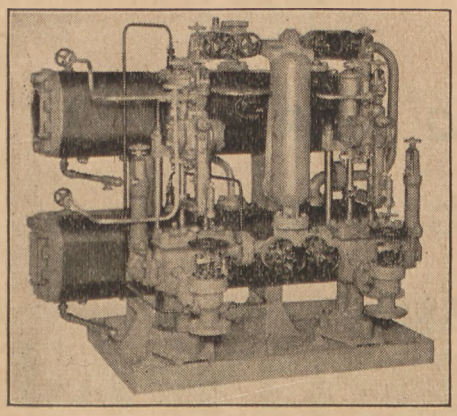

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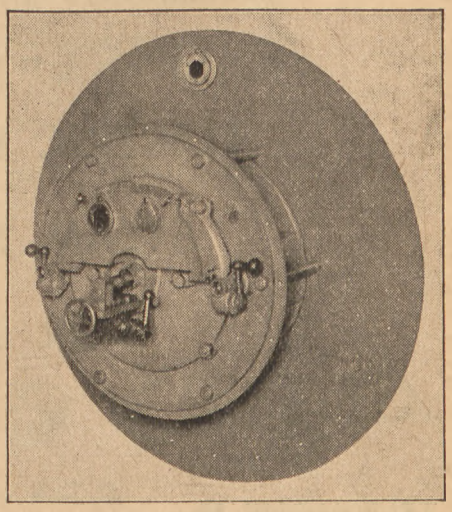

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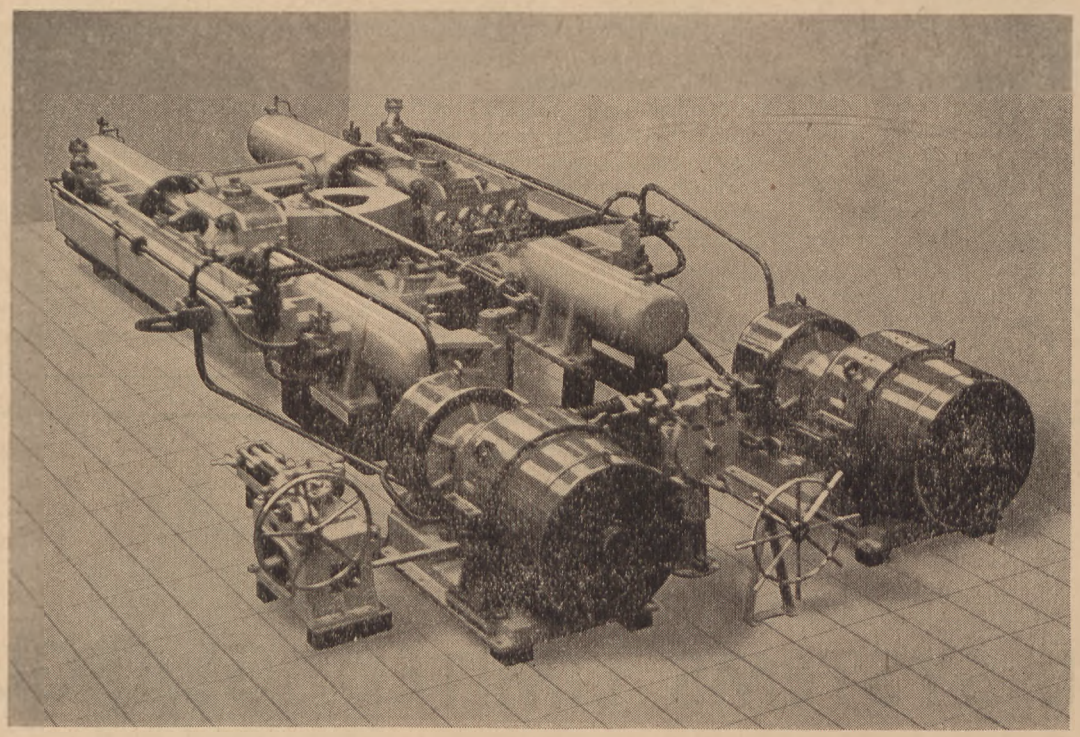

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a decision as to whether the welded ship will be the ship of the future. In the past, perhaps, our ideas on welding may have been ultra-cautious, and many shipowners and shipbuilders would have held up their hands in horror at the idea of welding a ship in sections. It may be considered that a welded ship is a "strong and goodly vessel"; but the business of ship operation has to be conducted on economic principles. Will the first cost of the welded ship be less than a riveted vessel? Will the repair bill be lower? Will it be possible to carry out repairs as expeditiously as can be effected with riveted ships?

All these factors will have to be weighed in the balance, and possibly much more proved data will be necessary than is available at present before these questions can be answered; but shipowners and shipbuilders are becoming "welding conscious," and there is no doubt that if, after the war, the British shipowner demands a welded ship instead of a riveted ship, the British shipbuilding industry will be able to supply his needs. The future developments of welding and the experiences of welded ships will be awaited with the keenest interest.

Future of British Shipping

Those who man and those who build our merchant ships are necessarily concerned with the post-war future which they are fighting and working to secure. The future of British shipping has been the subject of much thought in shipping circles. It is a difficult question, especially since theorists and idealists are confusing the issue, and have found in it a fruitful theme for discussion, and there are fears that their views, expressed with much volubility, may have a certain amount of influence upon the general public and those entitled to vote at general elections.

It is almost platitudinous to say that the present and future existence of the British nation depends upon the sea and the possession of an efficient merchant fleet and a sufficiency of well-manned and well-managed ships to carry out an essential service. A certain amount of State control and administration is no doubt inevitable in times of war, but everyone associated with the shipping industry and the operation of ships which have been requisitioned in the national service can, from his own experience, give many examples of waste of shipping space and inefficiency as a result of departmental control. This tends to delay in making decisions and lost time in the loading and discharging of our ships. Some of this is unavoidable, but much could be avoided, and would certainly not be allowed in peace-time by any private shipping management.

Mr. Philip Runciman, the president of the Chamber of Shipping, addressing shareholders of the Anchor Line at their annual general meeting, expressed himself in forthright and emphatic language on the subject of the nationalisation of shipping. Shipowners, he said, were now studying methods and ways and means by which the British Merchant Navy could be rebuilt, and one of the things to which they were giving the greatest study was how to avoid having to ask the Government for anything in the nature of a gift. In addition to our own losses, Allied and enemy shipping has been greatly reduced as a result of the war at sea, and when peace comes it may be expected that there will be a tremendous deficiency in ocean-going tonnage.

Meanwhile, shipbuilding capacity has been substantially increased, and, possibly, in the course of a short space of time, this deficiency will be made good. At the same time, however, it may be expected that shipbuilding

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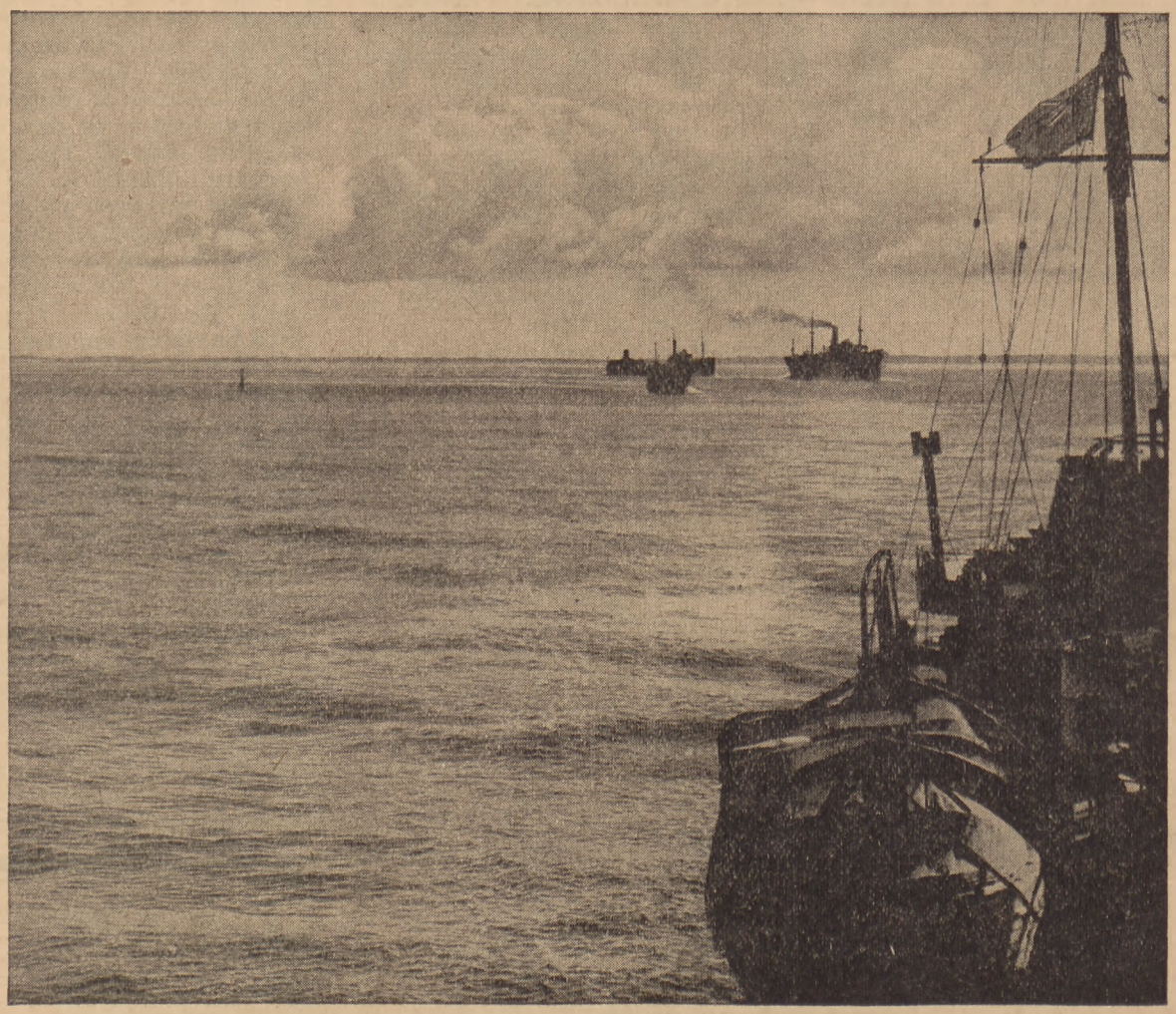

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costs will be at a much higher level than before the war. For a time world shipping may be a political issue; but the best interests of the nation will be served by entrusting British shipowners with the management of their fleets and allowing them to replace old and obsolete vessels and war losses as quickly as possible.

The future of the sea-going personnel is bound up with that of the shipping industry. A prosperous and efficient merchant fleet guarantees security of employment and better conditions for those who man our ships; and shipowners as a body are animated with a great desire to see that the valiant work which has been and is being performed by the men of the Merchant Navy shall be recognised by the general public, and thus ensure that these conditions shall prevail when the war is over and victory has been won.

In the House of Lords, Lord Marchwood has raised the question of the future of the Merchant Navy by asking what steps the Government are prepared to take "to meet the situation which will confront the shipping industry upon the cessation of hostilities." His question had particular relation to the conditions of employment in the Merchant Navy, and did not touch upon the larger issues which will face the industry when peace returns.

On its part the Government have promised that *after the war,* the necessity of maintaining our Merchant Navy in adequate strength and efficiency would be their obligation. On this point, Lord Leathers, replying to Lord Marchwood, said that the aim of the Government would be to secure, as far as can be done, that after the war the British Merchant Navy "shall be maintained in adequate strength and in a position of full efficiency," including the best attainable conditions of employment for officers and men. This adds little, if anything, to former assurances of a like nature given by responsible representatives of the Government, and the assurance is not strengthened by the addition of the words "as far as can be done."

These promises, it should be noted, are given on the basis of a question which deals chiefly with the conditions of employment for officers and men of the Service. Such conditions are absolutely dependent upon the existence of a strong Merchant Navy actively engaged in remunerative employment, so that the basis of satisfactory service for the personnel is a sufficiency of good and efficient ships which should not be dependent upon public money for their upkeep. That is the ideal which the shipowner has always kept in the forefront of his vision of the future, and which he hopes to secure by making adequate provision, as far as that is possible, to meet high post-war costs.

Shipowners' Problems

That shipowners are confronted by problems as grave as they are difficult of solution is one of those obvious truths which cannot be too frequently reiterated if the industry is to secure official realisation of the fact. Shipping affords many examples of the trials and tribulations which are born of official interference and control. If there is one problem among the many to be solved which demands the most exacting consideration by the industry and the patient goodwill and help of the Government more than any other it is that of tonnage replacement.

The subject is full of intricacies and pitfalls. Whether it be looked at from the point of view of the owner anxious in regard to the future and desirous only of being in a position to rehabilitate himself after the war; or that of the Government ever assuring us of their high regard for and determination to place shipping upon a sound foot-

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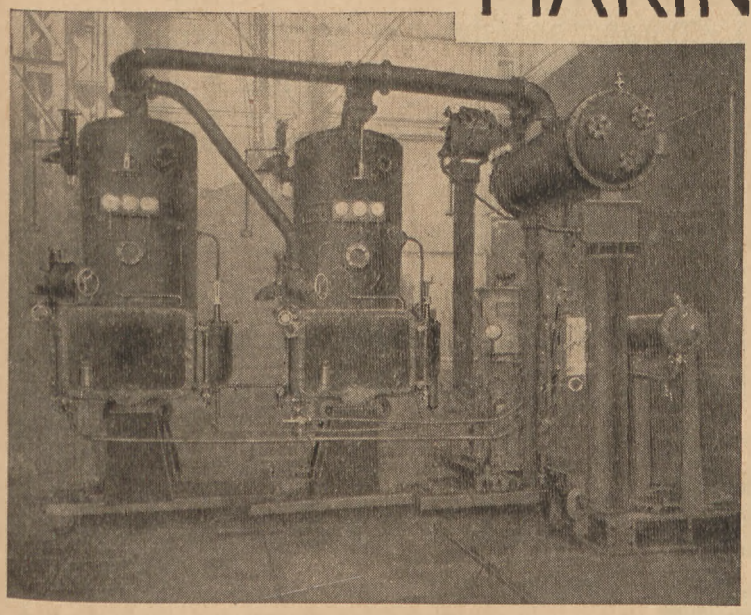

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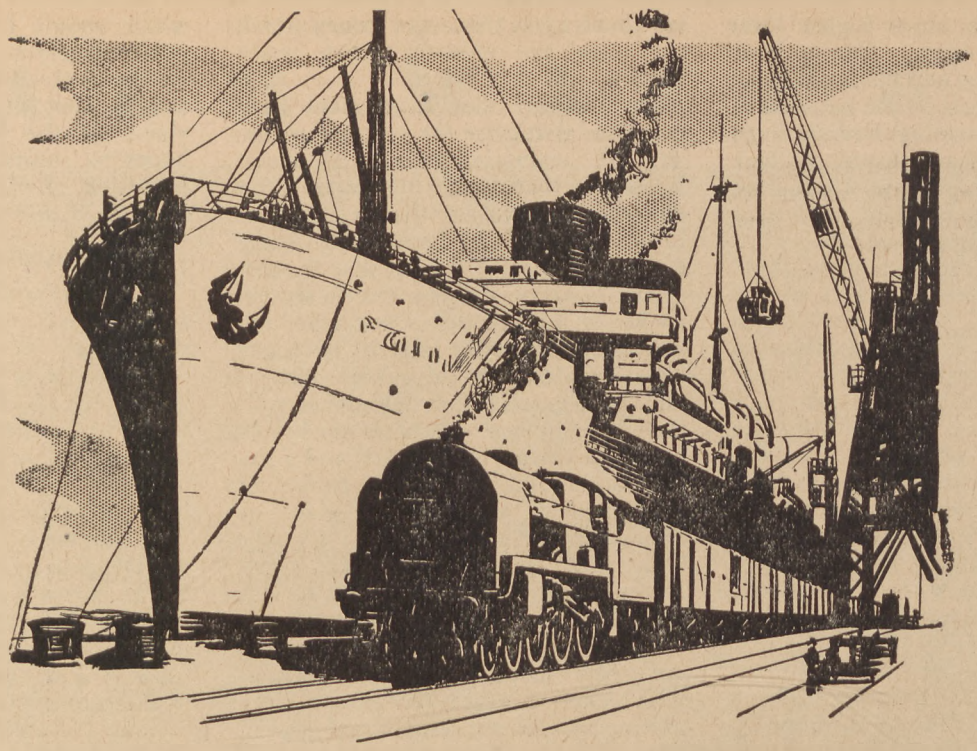

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ing; or of the nation which can only exist if its shipping services be well maintained, the gravity of the issue is at once apparent.

One thing is positively certain. We must have ships, and that being conceded the question of the means for paying for the tonnage at once arises. It is acknowledged that the provision that is allowed for replacement is wholly insufficient. But it is not at all clear to owners how far the rapidly increasing costs of tonnage will go before the new normal is reached. Some contend that 40, 50 or an extreme of 60 per cent. will be the maximum increase over immediate pre-war costs. There is, however, evidence, based on estimates received, that in some instances, at any rate, 100 per cent. and over is and is likely to be the standard.

These increases cannot be met by the old 5 per cent. depreciation basis on a life of 20 years. It has to be recognised that many ships have been lost and many more will be obsolescent long before the accepted life has been worked, and, practically speaking, the units of this great service are under-insured if costs of building be, as they are, the primary factor in replacement. War usage may easily reduce the life to 15 years or less and consequently only widen the serious gap which already exists between the amount set aside for depreciation or recoverable by insurance and the cost of new tonnage.

It is, therefore, imperative that the Government and the industry should determine how best to bridge this gap. That is the conundrum which is exercising the minds of those responsible to a great body of trusting, tolerant and patient shareholders, for, to attract and retain the investor, a reasonable return and security are essential.

Coastal Traders.

To-day our coastal shipping is carrying more cargoes than at any time before the war, and this is only one illustration of the very important place coastal traffic holds in our transport system. This was further emphasised in the remarks of Mr. W. J. Everard, chairman of the British Motor and Sailing Ship Owners' Association, at the annual meeting of that body. He pointed out that the home trade limits were not the ports in this country, but covered a much wider field.

Besides the short sea and cross-Channel services, a considerable number of ports in the near Continent were served by coastal shipowners before the war, and as these coasting ships are the nursery of our Merchant Navy, and through it of the Royal Navy, it would be seen, said Mr. Everard, that we cannot afford to do anything that would imperil the service or make it less efficient. It should be maintained in full and adequate strength after the war under conditions that would make it possible to secure not only continuity of employment, but really good conditions of service.

What affects the shipping of the country must inevitably have its repercussions on the coasting ships, and therefore it is pertinent to ask whether nationalisation is really desirable in the shipping industry. In relation to the coasting trade, this question of nationalisation has arisen on two occasions in debates in the House of Lords. First, it was submitted that the inland transport services (of which coastwise shipping forms an important part) should be nationalised, and later it was argued that the public services of the country (again including coastwise shipping) should be brought under unified management and become part of some public corporation.

It was incumbent on those concerned to point out that no scheme

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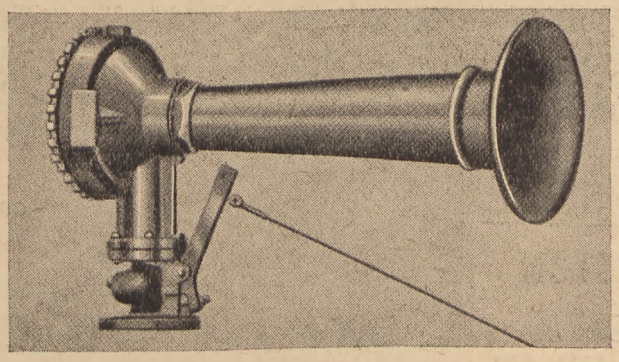

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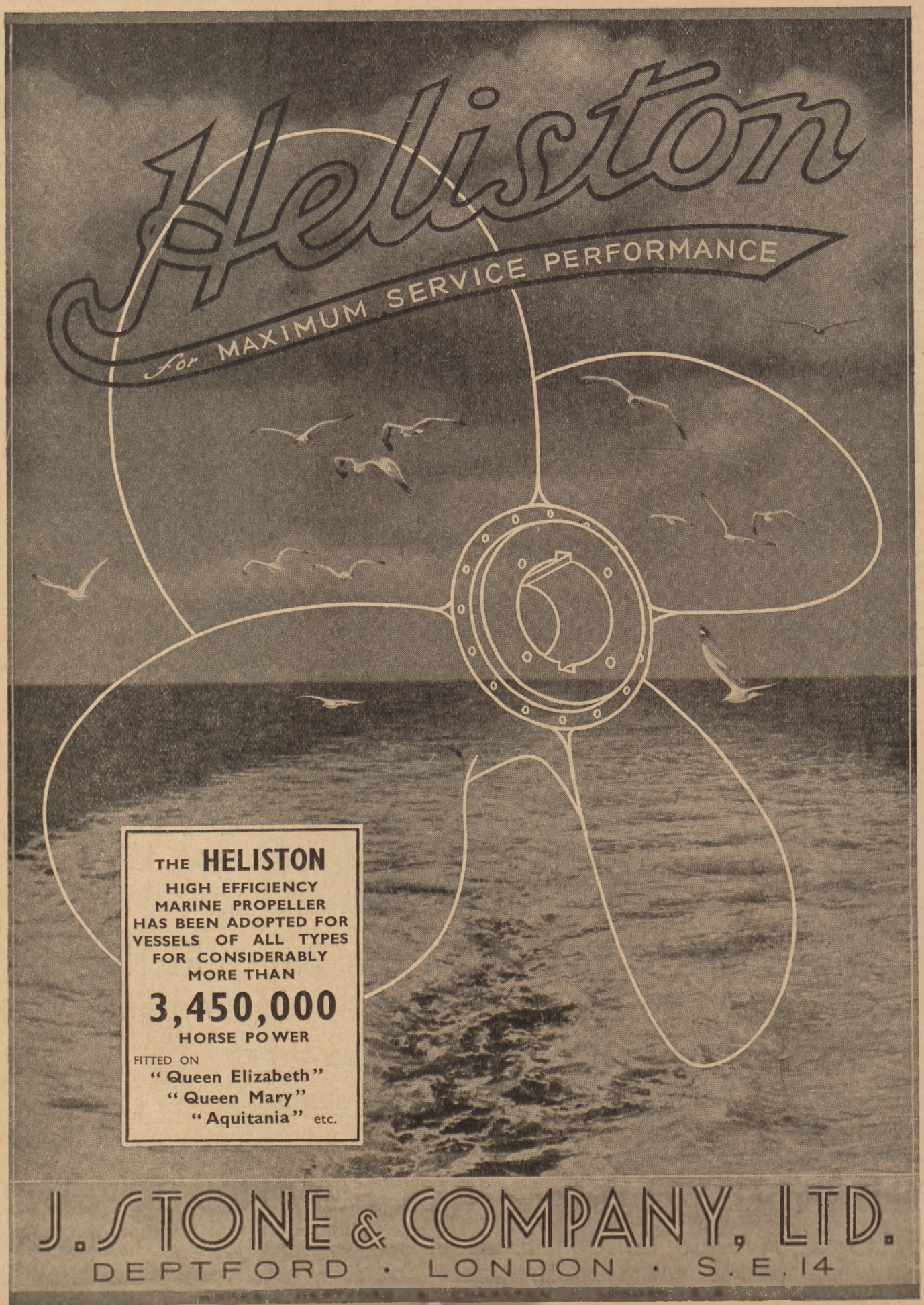
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of nationalisation for shipping could succeed, nor, added Mr. Everard, could coastal shipping be dealt with as if it were merely one part of our internal transport. One need not go far to see the evil results of the nationalisation of shipping, as shown in the experiments made by the Australian and Canadian Governments. Unwise legislation adversely affecting the coasting trade would certainly react on the home trades, and might in the end mean the total elimination of the British flag from these trades.

One of the most potent objections to a unified control, such as would be brought about by nationalisation, is that the work to be done is subject to immediate decisions and frequent re-arrangement of tonnage programmes, impossible under any such control. At the present time when the country is passing through its most serious crisis, and efficiency of transport essential, the Government have found it best to leave to the coasting tramp owners the running of their own fleets free of general requisition, subject only to a system of control for voyages and freights. Economical management is one of the chief reasons why the coastal services are able to face severe competition, and there is no margin for expensive management.

Coastwise shipping was rightly aggrieved when in October a publication was issued by the Ministry of Information for the Ministry of War Transport purporting to be "the official story of British Transport, 1939-1942." It contained, however, no reference to the part coastal shipping plays in the distribution of munitions and food supplies between ports of arrival and despatch, the great manufacturing centres and the areas of large population. Yet it is not denied that coastwise services are ensuring to a greater degree than ever before the smooth and safe operation of the whole of the nation's transportation system. Without the steady help of these regular sailings neither rail nor road could cope with the enormous volume of traffic that has to be moved.

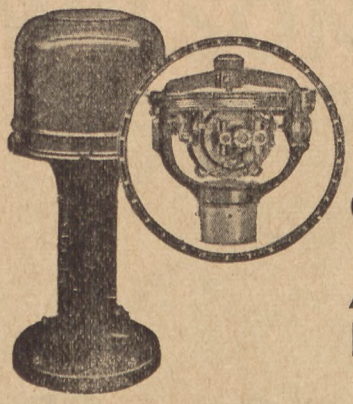
It was subsequently explained by Lord Leathers that the booklet had, for reasons of space, to be confined to the land side of our transport system. He added that the story of the coasting ships would be told at the right time.

Merchant Service of the Air

Shipping after the war presents many problems for the industry's able managers. One of them is undoubtedly the extent of competition (or preferably co-operation) that will be provided by air transport after the war.

Is is the opinion of Mr. E. C. Gordon England, chairman of the Engineering Industries' Association, that we may be condemned by history "for our blindness is not setting up a Ministry charged with the sole responsibility of creating . . . a merchant service of the air to stand behind the Air Force . . . as the Merchant Navy stands behind the Navy." It is true that we have not charged a Ministry with this responsibility, but there is evidence that we have realised that aviation, commercial or otherwise, has come to stay as one of the most important influences on the trade of the world. The matter has received the most careful attention of some of our foremost shipping men, who are not only aware that air carriage is a potential rival of sea carriage, but that the two services can be linked the one with the other, and that the development of the new service along the best lines can reasonably be associated with the fortunes of the shipping industry.

Addressing members of the Institute of Export, Mr. England claimed that Great Britain "is the actual centre-point of nearly the whole of the earth's dry land," which, he added, means that we should become the hub of the world's merchant air services. Here we



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have the opportunity of performing the greatest service we can render to a civilised and peaceful world. "To-day, we must begin," added Mr. England, "to think in terms of what large fleets may and will mean to our trade after the war." As has been said already, this point of view has been in the minds of the leaders of the shipping community for some years past.

Mr. England envisages the use of a fleet of 5,000 planes, which with a load of 20 tons, making a round trans-Atlantic trip every four days, would move 150,000 tons per week in both directions. This, he suggests, is a new conception of speed in the execution of overseas orders, and a fluidity of movement both of passengers and goods "undreamt of until to-day." Under such circumstances, the speaker believes we should have to face entirely new conceptions of international trade. He suggests that we must march forward with the other nations, each with its Merchant Air Service and its appropriate Minister, who, jointly, would form a Commonwealth Board of Merchant Air Services.

Later, Mr. England referred to the fact that the virtual monopoly given by the Government to British Overseas Airways, formerly Imperial Airways, had slowed down the technical development stimulated by free competition, and, he added, that he did not believe it was in the interests either of British Overseas Airways or of the country "that the whole of the nation's future possibilities in civil aviation should be entrusted to one group." Yet he had previously advocated that such an aviation service (in each country) should be controlled by a Minister, which would, of course, mean Government control, even though he considers that each nation must undertake to see that its Merchant Air Service is free from military control.

The analogy between the merchant shipping service and the merchant aerial service is so close that freedom from bureaucratic control must be as necessary to the useful existence of the one as to the other. On this point shipping opinion is fairly unanimous in regard to the control of the Merchant Navy, and there is, indeed, little doubt that in peace-time the shipping industry could not long survive, as far as its efficiency is concerned, were it deprived of its freedom of action.

With reference to post-war operation of air services—whether they should be the monopoly of one group or open to competition—an interesting proposal, for which there is a precedent in the carriage of mail by surface ships, was made by a shipowner in an article in "The Times," in which he discussed the future of British civil aviation.

It was suggested that the soundest policy after the war might well be the open invitation of tenders for the lowest subsidy to operate for five years a specified air service from Great Britain along each of the main traffic routes. It was added that such an invitation would give the established British shipping lines all that they could fairly ask.

The views of the Hon. W. L. Runciman may well be recorded here. As a member of a famous shipping family, he is experienced in ship operation, on which he has superimposed his knowledge of commercial aviation as director-general of British Overseas Airways Corporation.

Addressing the Institute of Transport in December on the future of air transport, Mr. Runciman said it would probably not be worth any shipowners' while to build very fast luxury liners again though cruising traffic might justify the luxury without the speed, but it would still be worth while building mixed passenger and cargo vessels of moderate speed though this would

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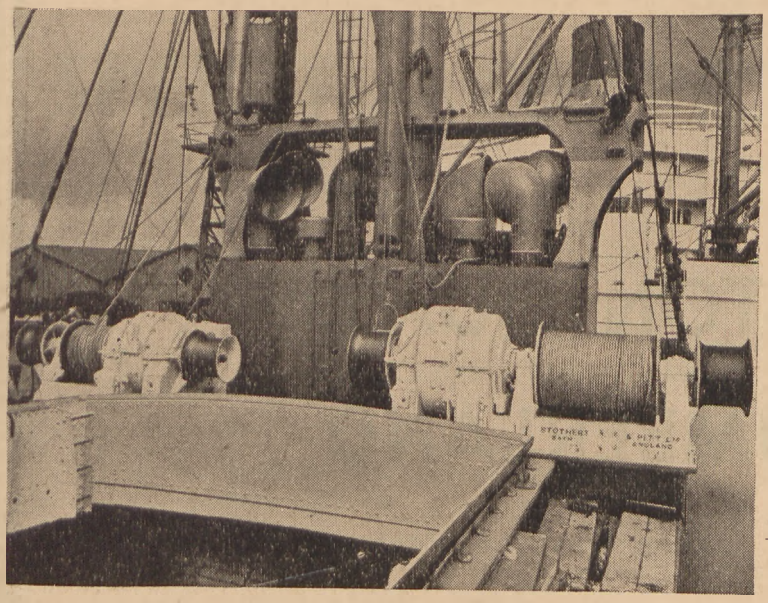

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depend largely on how much the human race moved itself and its goods about its planet in the years to come.

"You are committed to your ship for the life of some 20 years: you have to renew your aircraft every five, so that you have four times the opportunity of keeping up to date," he continued.

"I do not expect general cargo shipping to be seriously affected one way or the other by air competition, at least in my lifetime. I shall be surprised if long distance rail travel of the more luxurious sort survives many more years. Here again, the borderline is likely to come at the distance which can be easily covered outside the normal working hours of the day, though price will obviously enter in. Short haul goods traffic will still go by road because it will be a long time before the gain in time by air offsets the loss of time of transhipment from a van or lorry to an aircraft and back again, and it will be a longer time still before air transport habitually collects or delivers your goods at your door

"Some people would say that all this means merely that the air is going to skim the cream of everybody else's traffic. I do not believe this to be true. I have heard shipowners say they would sooner be without a mail contract than with one. The railways will probably keep most of the third-class domestic traffic in nearly every country where distances are not very great. Generally so far as air transport stimulates the desire for travel and by virtue of its greater speed enables people to make journeys who would otherwise not have time to do so, transport as a whole will benefit unless the universal experience of more than one generation is to be belied.

"A balanced system of transport is not one where every mode of conveyance is pressed into service along every route but where road, rail, air and sea each perform the services they do best. We shall none of us survive unless we give the public, who, whether as passenger or taxpayer, will have to pay for it, the transport it requires.

"There will be a certain amount of trial and error before this is accomplished. Some think the error will be less if a wise Government or other authority plans for us what each of us may take and where others believe that the free or fairly free play of competition will more speedily bring us to an equilibrium where we can all prosper.

"I am not concerned here and now to judge between these views, but only to record my conviction that both now and in the future there is a place for every form of transport and that we shall all find plenty of opportunity to exercise our wits and line our pockets in discovering how best to carry the greatest possible loads in the best possible way."

What Lies Before

Many of the subjects that have been touched upon in this discursive introductory survey are the subject of individual articles in later pages. The whole may be said not only to present a survey of events that have taken place in another year of world conflict but also to provide many indications of what lies before, of the shape of things to come. Certain it is that in the building and operation of ships of commerce—ships that move through the air as well as on the surface of the seas—many changes will take place and they will be expedited by the stimulus that war necessarily gives to inventive genius and to improvisation.

We look forward with confidence to the time when the victory of the United Nations will open the way to a new era in world trade, with confidence also in the ability of the maritime industries of this country to master the new conditions as they did the old. Certain it is that when peace returns the nation and Empire will need to be as united in purpose as they have been during the war if they are to make good the loss and wastage and maintain the place they have long occupied in the affairs of the world.

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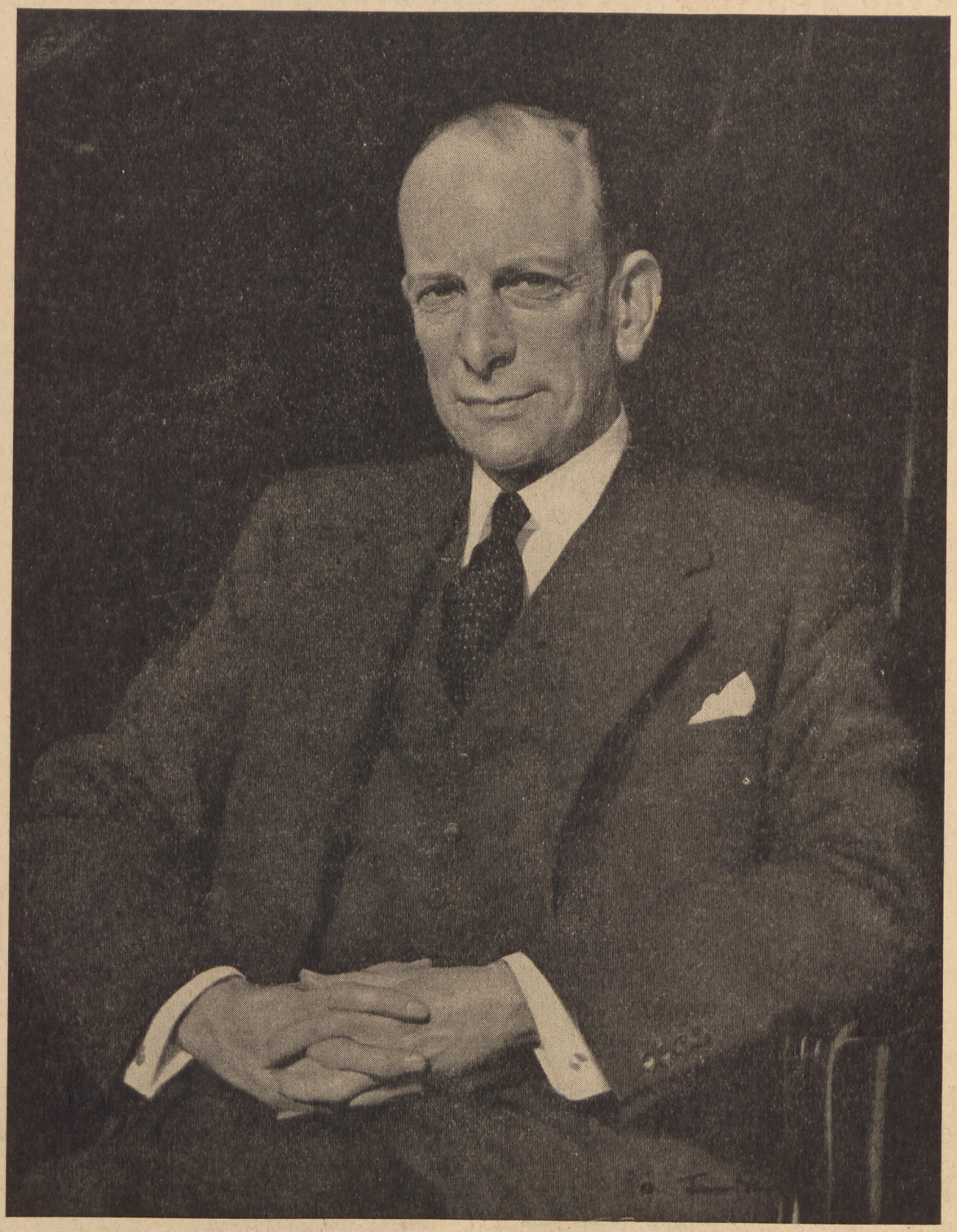
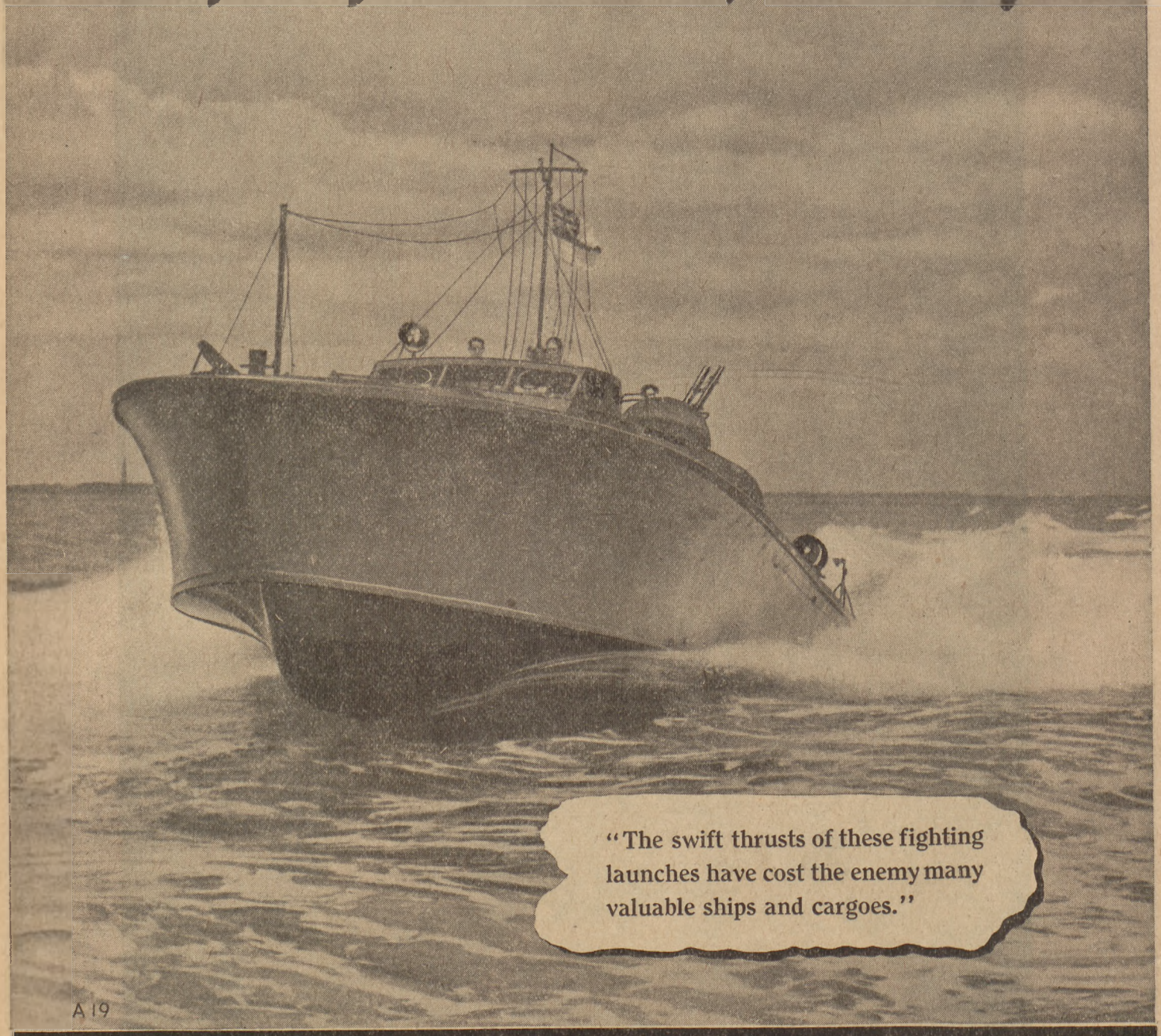


THE RT. HON. LORD LEATHERS, Minister of War Transport, who has sent to THE ANNUAL REVIEW the Foreword appearing on Page 97.

Singeing the enemy's beard!



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FOREWORD BY THE RT. HON. LORD LEATHERS

WE all hope that the encouraging events of recent months have brought us to the end of the long defensive phase of the war. The offensive has begun.

In shipping we are similarly encouraged by the fact that in recent months the joint shipping production in the yards of the United Nations has exceeded our losses, but we must remember that the scale of U-boat attack is growing. The enemy is sparing no efforts to increase his already great output of these menacing craft.

At this moment we must once more intensify our efforts to speed the turn round of ships and to make sure that we plan their use so that not one ton of shipping is wasted. By so doing, and only by so doing, can we of the shipping industry put all our weight behind the punches which our Armed Forces will strike at the enemy. As you know, the British and Allied Merchant Fleets made a powerful and necessary contribution to the successful occupation of North West Africa. This operation was the climax to an arduous and difficult year in which our Merchant Fleets were engaged to the full, each ship in its own way contributing to the downfall of the enemy.

I must again express my own deep sense of gratitude to the officers and men of the British and Allied Merchant Navies and also to all who have worked so well on the docks, in the building and repair yards and in their offices; in thus expressing my thanks I know that I speak for the whole British people.

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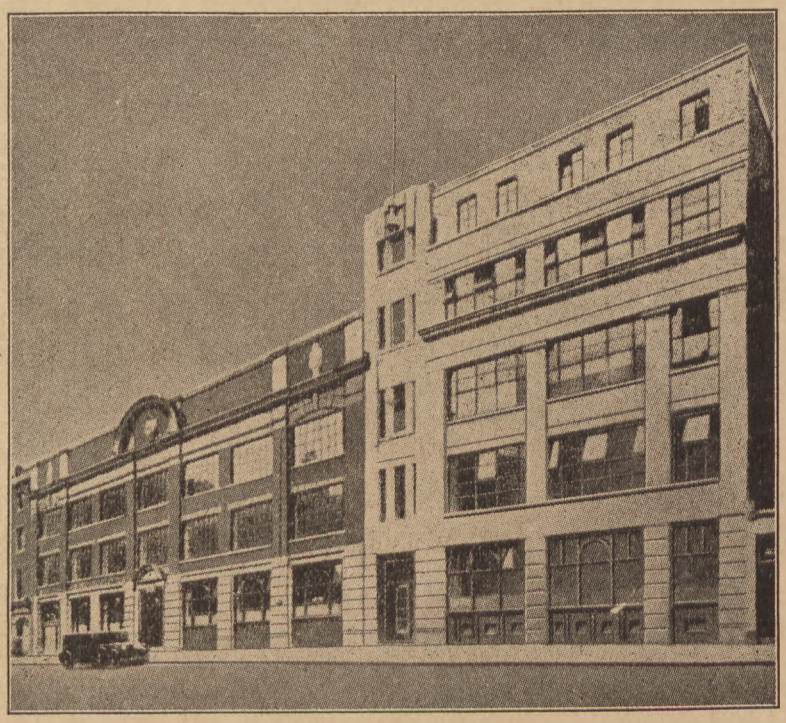

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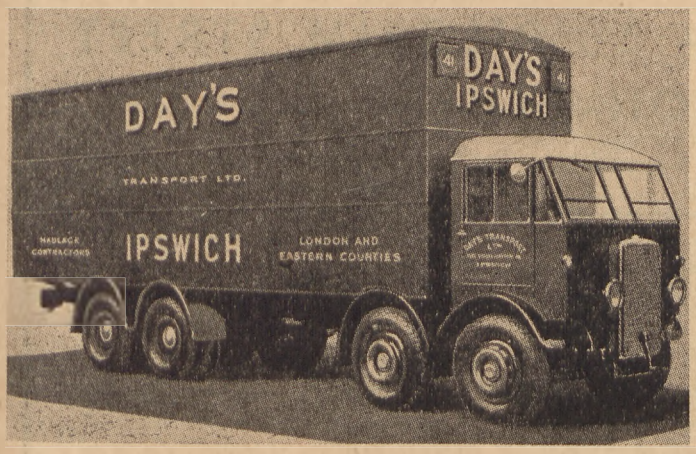

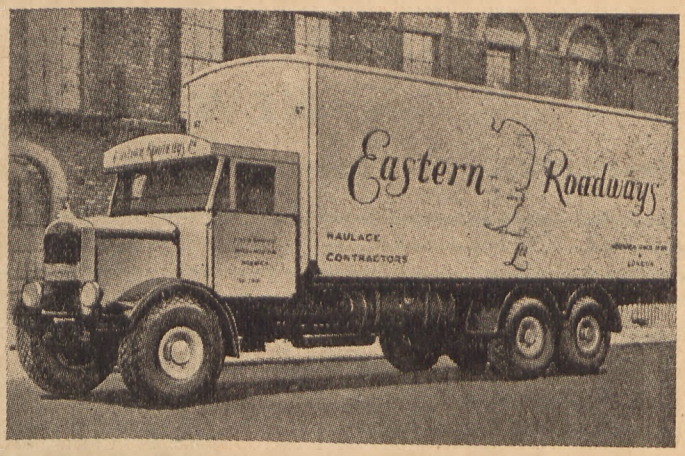

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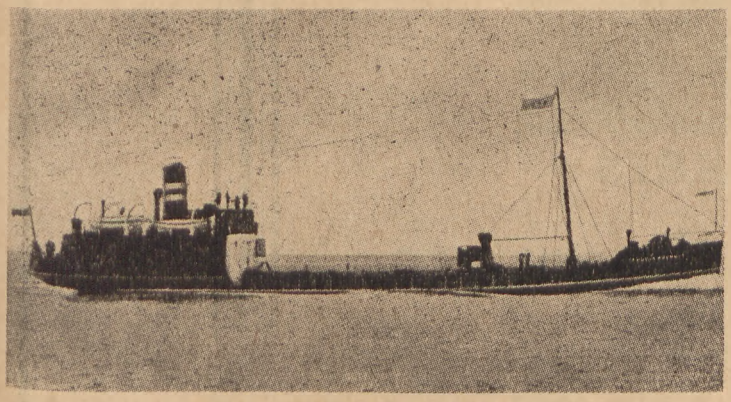

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Shipping *MUST BE LEFT* To Private Enterprise *AFTER THE WAR*

By PHILIP RUNCIMAN, President of the Chamber of Shipping

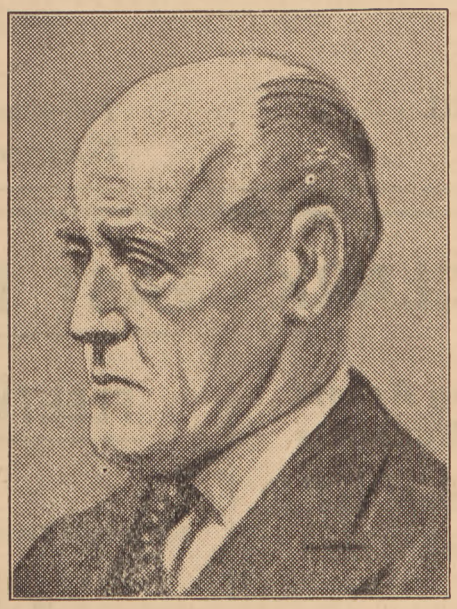
THERE are some things which are so familiar to us that we never notice them. The British Mercantile Marine, in particular, has for so long been an integral part of the life of these islands that the public took it for granted. When the war broke out we heard a good deal about the future battles of the air and the land, but so firm was the confidence of the nation in the Merchant Navy and the Royal Navy that few people expected any major struggle on the sea. We were prepared for embarrassment but the possibility of defeat or even of serious challenge in marine control was regarded as very remote.

It has taken nearly three years of war for the people of these islands to wake up to reality and to realise what a part the Mercantile Marine and its men are playing, how vital it is to the war effort and how great are the risks and sacrifices falling on the shipping industry. But even now I doubt whether the public fully appreciate that twice in 25 years the personal enterprise and determination of British shipowners has assured us of a fleet of ships which not only guarantee our supplies but furnish the Navy with auxiliaries into the bargain. Without that fleet we could not have taken up Germany's challenge at all. Had we lost it we must inevitably have lost the war. Hitler, at any rate, has now realised that fact to the full, hence the feverish intensification of U-boat construction in the past year.

The public should be made to understand that this vital fleet of ours was not created by the State. It is the result of many years of unremitting effort by well-directed private enterprise. Shipowners in this country have carried on their businesses in the face of many obstacles, the keenest competition, even sometimes direct subsidised attack from foreign countries; but they have nevertheless succeeded in maintaining the largest and most efficient fleet under any flag.

In the past Governments have shown the highest wisdom in leaving shipowners to get on with their own job.

The size of our mercantile fleet is not a mere economic accident. It is due to the endeavours of a long line of shipowners who displayed foresight, initiative and enterprise, who were not afraid of taking risks, who



seized on technical improvements with energy and vision, who, in short, displayed all those qualities which are so conspicuously absent from the modern bureaucrat. If anyone doubts this I invite him to consider what sort of fleet we should have if the Mercantile Marine had been constructed and operated in the nineteenth century by a Government Department. It is amusing to remember that the biggest developments in our fleet were taking place just about the time that Charles Dickens epitomised the qualities of the existing Civil Service in the Circumlocution Office. That was a long time ago I admit, but the traditions of the Circumlocution Office still haunt the precincts of Whitehall.

Let nobody think that I am trying to precipitate a conflict between private enterprise and the Government. On the contrary, I would like to see them both get on with their proper jobs, which are quite distinct. But I am, above all, a realist, and I wish to say quite definitely that in my view the only hope for a robust British Mercantile Marine in the future lies in the perpetuation of the type of man who has built it up in the past, the man who is self-trained in habits of clear thinking, quick and bold decision, individual initiative, and who is ready to take and permitted to take responsibility. This is the primary necessity. If it is disregarded in deference to political ideologies of nationalisation, if the difficult and skilled work of conducting a specialised business is to be entrusted to untrained and inexperienced amateurs, if the inventiveness and energy of private enterprise are to be chained to the treadmill of bureaucracy, we might as well resign ourselves now to an irreparable decline in our sea-carrying power and, indeed, in our position among the leading nations of the world. To put it quite bluntly, we shall be run out of the market.

The experience of the last 20 years has proved, if proof were needed, that no section of industry and no nation can permanently entrench itself behind protective barriers and hope to maintain security at the price of abandoning attempts to move forward. In the past Englishmen have led the world in industrial, intellectual and political progress. I believe that they can do so again. But let us realise quite clearly that the qualities which enabled them to do so were precisely those qualities which are threatened by nationalising zealots. We are fighting for freedom, and freedom leaves the way open to adventure, stimulates courage and self-reliance, and gives the prizes of life to those who show their capacity to win them.

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Some War Problems of British Liner Companies

By J. R. HOBHOUSE

Chairman of the Liverpool Steam Ship Owners' Association

Chairman of the General Council of British Shipping

THROUGHOUT 1942 the war at sea has continued with unrelenting fury. Grievous losses have been and are being sustained and there is no room for complacency. Sea power is demonstrated as the crucial factor on which the whole war effort of the United Nations hinges, and unless it can be maintained all else must fail.

The Liverpool Steam Ship Owners' Association has taken advantage of every opportunity presented to it to urge on the Government the vital importance of placing the constructive and the protective needs of merchant shipping in the forefront of priority. It has noted with satisfaction the insistence of General Smuts on this issue and the setting up of a special organisation to deal with it.

Full recognition is due to the part played by all those employed on board the ships who, so untiringly and with so much devotion to duty, face the perils of the ocean voyage. Their services rank equally with that of our soldiers, sailors and airmen. Recognition is due also to the shipowners who, notwithstanding long years of depression and discouragement, maintained their faith in their industry and by so doing put at the disposal of the nation on the outbreak of war the tonnage essential to its ability to wage war.

The situation is still such as to make it possible only provisionally to plan post-war policy. It is clear, however, that when the end of the war comes a substantial and possibly the greater part of the British Merchant Marine will consist of war-built and Government-owned vessels. The crucial question for shipowners is whether, with the large sums derived from the insurance money of lost ships they will then have in hand, they will be able to replace their lost and their then surviving obsolete tonnage at a cost which will hold out reasonable promise of economic employment of the ships so built in post-war international trade.

Immediately after the last war, ships were replaced at a cost far in excess of what was subsequently found to be their earning capacity; an over-optimistic view was taken of the future and of the capability of world statecraft to steer the nations along lines of constructive international economy. The existence of a future after this war for British shipping in strength and quality comparable with its past depends on the reversal of those "between the wars" policies of economic self-sufficiency and isolation which contributed so largely to the renewal of armed conflict in 1939.

A start of a limited kind has been made towards replacement through the scheme agreed between the Ministry of War Transport and the General Council of British Shipping for the sale to shipowners, on terms of post-war delivery, of ships built for Government account during the war. It is satisfactory to record that nearly all the ships covered by the first allocation under this scheme have been taken up and that a second allocation is under way.

The scheme has, however, contributed little towards the replacement problems of the liner companies, as not many ships of the liner type have so far become available. The lines are having to look instead to such facilities as are open to them in war-time to get licences from the Admiralty to build. The types for which licences are available are lmiited in number and standard in character, and do not provide for specialised trading requirements.

That is recognised as inevitable and no complaint is made of it, although it is hoped that those in charge of the shipbuilding programme during the war will maintain a reasonably flexible system and subject to the over-riding exigencies of the war will have regard to the national needs after the war for a well-balanced Mercantile Marine. In present circumstances, there is a greater demand on the part of the lines for building licences than the supply of building facilities can satisfy, and the General Council has expressed the view that building on Government account should only be undertaken where there is no applicant for a licence to build a ship of the type required. Indeed, that view was stated in the early days of the war to represent the considered policy of the Government.

At the close of the year the Council had under consideration a plan to allocate available licences in relationship to losses sustained, so as to give equitable distribution of the available facilities. These schemes, however, only touch the fringe of the replacement problem which, stated shortly, is the provision in the years immediately following the war of the tools of the industry's trade at prices which will ensure their economic usefulness.

Another feature of the year 1942 in the domestic sphere of the liner section of the industry has been the work done under the auspices of the British Liner Committee in connection with liner requisition rates of hire. The original hiring agreement was negotiated with the Ministry of Shipping, as it then was, in the summer of 1940 and covered the whole range, from the largest to the smallest vessel of the liner class. The rates of hire then agreed consisted of two parts.

First, there was agreed a "basic rate" designed on average to cover the actual operating expenses of the ships borne by their owners under the Government requisition charter-parties, e.g., crews' wages, repairs and surveys, stores, provisions and the like. This part of the rate, in other words, was designed to reimburse, by reference to average costs, the running expenses actually incurred, with a small margin for future contingencies.

Secondly, there was agreed an allowance in respect of depreciation and interest on capital at the rate of 10 per cent. per annum, of which 5 per cent. represented depreciation, on the agreed value of the ship—a value which was assessed by reference to first or second hand cost or insured value according to the age of the ship and the circumstances of its original acquiry. This allowance, fixed on this basis, as a result, it was understood, of a Cabinet decision, constitutes that part of the whole rate of hire which represents the remuneration received by the owner for the hire of his ship.

As a further term of the whole scheme, the shore organisations of the lines in this country and abroad were placed at the disposal of the Govern-

(Continued on Page 107)

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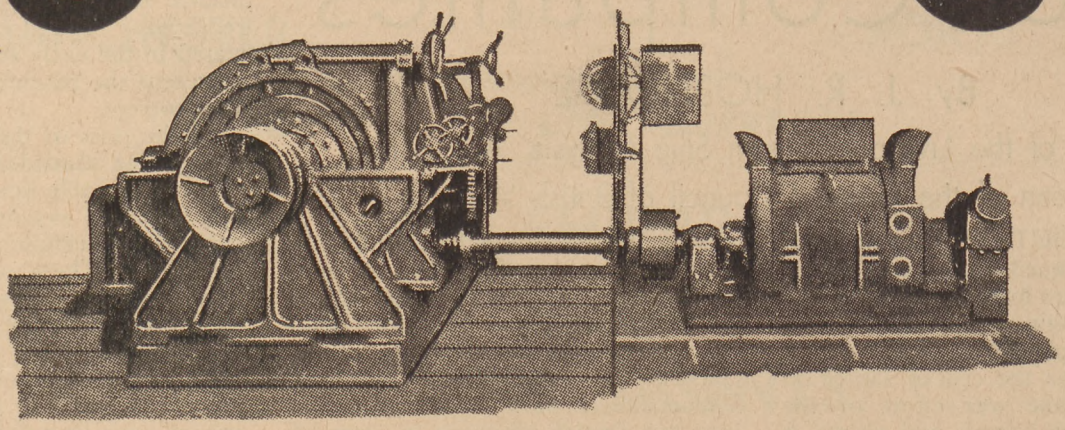

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The Position of the Shipbroker During and After the War

By
HUBERT O. ROBERTS, F.I.C.S.
Chairman of the Institute of Chartered Shipbrokers 1940-1943

TO many people, including even some connected with the shipping industry, the term shipbroker signifies one who buys or sells ships, or one who fixes ships, whereas in reality the members of the Institute of Chartered Shipbrokers fall into one or more of the following categories into which the profession is divided :—

1. The sale and purchase broker who buys or sells vessels for his principals or arranges contracts for building new vessels.
2. The shipowner's broker who finds cargoes for vessels to carry.
3. The charterer's or merchant's agent who finds ships to carry the cargoes. Nos. 2 and 3 are again often divided into those dealing with British or foreign principals.
4. The coasting broker who often combines the functions of Nos. 2 and 3.
5. The cabling agent whose business it is to keep the London market acquainted with, say, the New York charterers' tonnage requirements and vice versa.
6. The ship's agent who attends to the loading, discharging, bunkering, customs requirements, &c., of vessels whilst in port.

The interests of many firms may and often do include more than one of the above categories, but to whatever branch their activities are directed they are principally concerned with tramp tonnage.

Now I venture to state there is no tramp shipowner in the country who could or would deny that brokers have in the past been of very great service to the shipping industry in helping our Mercantile Marine to attain the position it held before the war, and when this war is won the broker will be needed as he has never been needed before if Great Britain is to regain that position but—will the broker be there?

What is the position to-day? I do not contend that all brokers of all categories have been severely hit by the war—some coasting brokers admit they have little of which to complain. Ships' agents at certain ports are in the same happy position owing to the war having caused a great increase of tonnage to be directed to their ports to the loss, unfortunately, of their brethren at other ports, but in the case of Liverpool in particular the position of the tramp agent has been adversely affected by the large number of tramp vessels which have been allocated to liner services and consequently consigned to liner companies or their agents.

Again, some owners' brokers with foreign connections are receiving a brokerage from their principals on the hire paid for allied and neutral vessels time-chartered to the Ministry of War Transport—a rate of hire incidentally far and away above that paid for requisitioned British vessels.

With these exceptions brokers find themselves left through Government intervention with a very small proportion of their business, and it is not too much to say that many are suffering real hardship. As a consequence of Government restriction, coupled with the embargo which every neutral nation has placed upon the transfer of its tonnage, the sale and purchase broker has had little or no opportunity of functioning since the outbreak of hostilities, nor is he being employed in the sale of the Government-owned ships to British owners.

With the notable exception of coal and certain cross-voyage cargoes, the charterers' or merchants' agent is concerned almost entirely with imported cargoes, and since all such cargoes are controlled by the Ministry of Food or Ministry of Supply and the tonnage to carry them allocated by the Ministry of War Transport, his business has practically, if not entirely ceased and it follows also that the owner's broker is likewise deprived of fixing vessels for homeward business and his opportunities of obtaining a brokerage confined to outward commercial coal cargoes and an occasional cross-voyage.

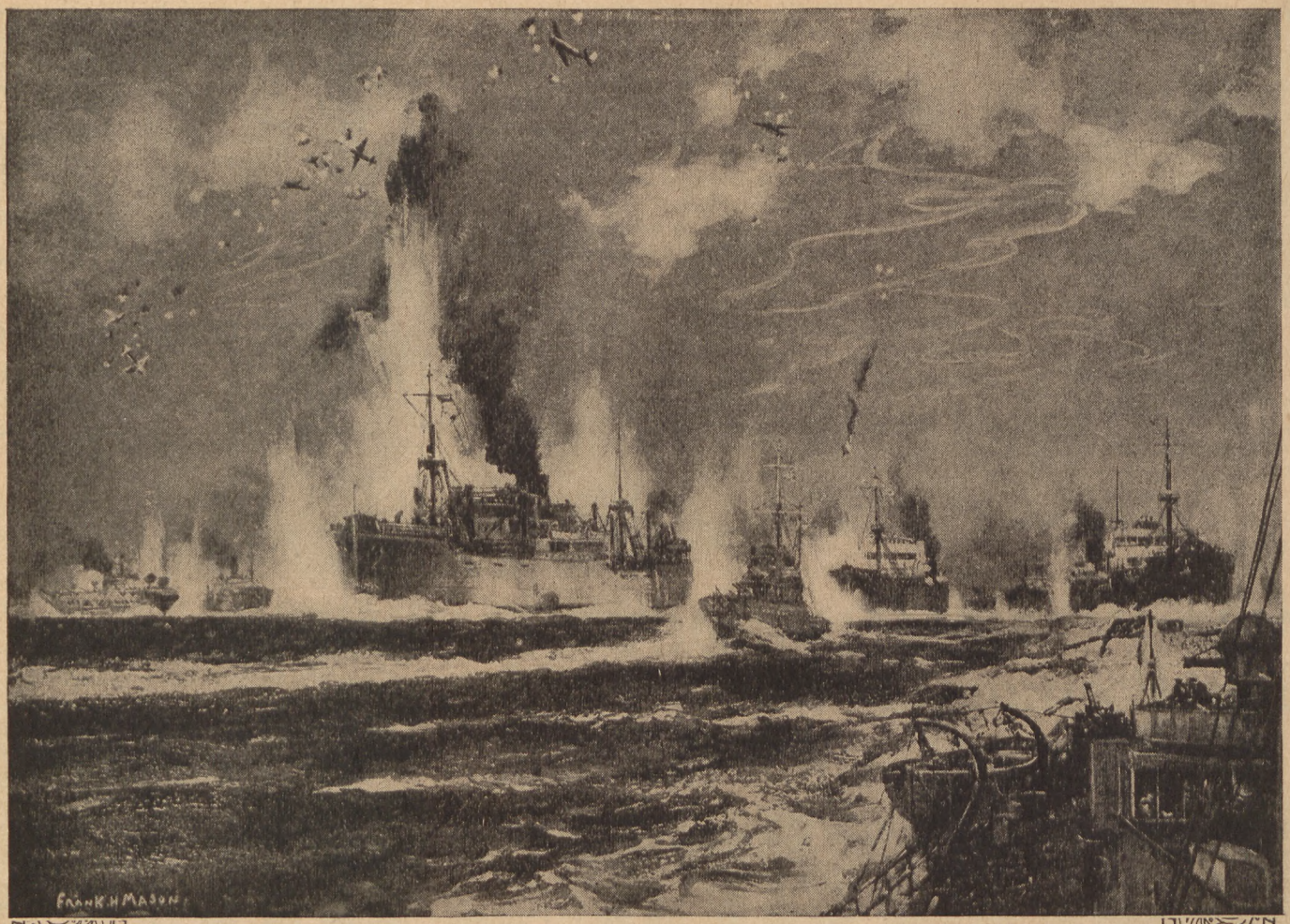
With the ever-increasing demands for coal by our home industries engaged in war-work and the decreased output of our pits, together with the many more urgent cargoes for which our ships are needed, it will be apparent how seldom a sixpenny stamp is required. I admit that when a fixture is made the brokerage received is a much larger amount than in peace-time, but such brokerages are indeed few and far between and their scarcity offsets by far the rise in freights.

When the Government requisitioned British tonnage the broker was told that all he was being deprived of was the homeward fixing, but figures given me by representative brokers and subsequently stated to the Ministry show that over a number of years immediately preceding the war 80 per cent. of their income was derived from homeward fixtures and only 20 per cent. from outward ones.

Such is the present position in which the shipbroker finds himself through no fault of his own, and, indeed, despite the many and continual efforts which have been made to the Government to improve his lot. Here I would say that on my many visits to Berkeley-square during the last three years, 99 per cent. of the Ministry of War Transport has always been sympathetic to and freely acknowledged the peace-time value of the shipbroker, but unfortunately the shipbroker cannot live on sympathy alone, although the Treasury would appear to think so.

I said two years ago that the shipbroker has had a raw deal and nothing has happened since then to cause me to change my opinion. Assuming for the sake of argument that the Government was justified in the national interest in dispensing with so many of the shipbrokers' services in war-time it was at least equally in the national interest that means should have been found by which to keep the shipbrokers and their organisations alive. In peace-time the shipbrokers' services are necessary to the merchant and the shipowner; that is proved by the fact that they were always employed by them in good times and bad.

It would appear to be extremely doubtful if the Government has any idea of the importance to the country of the profession or to the extent by which the country benefits by the very large amount of invisible exports produced by our efforts, and unless we are in a position to resume those efforts unimpaired when peace comes there is a grave danger of London



Mediterranean Convoy *by Frank H. Mason*

The Convoy got through

"Then what can I do for you, all you Big Steamers,
Oh, what can I do for your comfort and good?"
"Send out your big warships to watch your big waters,
That no one may stop us from bringing you food.

For the bread that you eat and the biscuits you nibble,
The sweets that you suck and the joints that you carve,
They are brought to you daily by All Us Big Steamers,
And if anyone hinders our coming you'll starve!"

—RUDYARD KIPLING (1910).

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POSTSCRIPT (1942)

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Your men are the stuff that heroes are made of,
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For the paints that we ship are all used on Big Steamers,
From the keel to the masthead to save wear and tear:
Whatever is known as paint or as varnish
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ceasing to be the world centre to which foreign merchants and owners turn to cover their requirements and so this considerable source of revenue will be lost.

What are the post-war prospects? In my opinion the answer to this question is entirely dependent on whether British shipping is to revert to private enterprise at the earliest possible moment or not. Our post-war position depends upon the position of the merchants and the shipowners—our fortunes are wrapped up in theirs—and their position and the welfare of the British Empire itself are contingent upon the possession of an efficient and economically managed Mercantile Marine.

Shipping is an international business; it is an individual business developed in this country by generations of shipowners who have inherited its traditions and experience and to nationalise an international industry is to court disaster, not only to the industry itself but to all other industries connected with it.

It has been tried before but at what a cost. It is common knowledge that whenever a Government has usurped the role of shipowner either the consumer has had to pay higher freight rates or the taxpayer has had to bear the cost of increased operating expenses or both.

In this connection it is surely significant that only a month or so ago Admiral Emory S. Land, the War Shipping Administrator and chairman of the Maritime Commission of the United States, speaking at a convention of the American Merchant Marine Conference, said:

"The complex problems presented by the war have obviously necessitated a considerable Governmental control and direction of private business but it is well to bear in mind that a return of that control to private business when the war emergency no longer exists is a definite part of our programme. That has been the intention of Congress and the Maritime Commission since its establishment. There has been no change in that policy. It is evident that post-war plans for a greater merchant fleet must be based on that promise."

As it is extremely doubtful if shipping could or should revert to the pre-war position immediately hostilities cease, it would appear to be necessary for it to be controlled in some modified form, and as the United States will probably be the largest shipowning country in the world, that control should be led by the United States and this country and by the industry itself —not by Civil Servants.

The machinery for such control already exists in the International Shipping Conference and the Tramp Shipping Administrative Committee and after the first urgent need of feeding the starving countries is accomplished then the shipping of all nations should be free to perform voyages under licence at controlled rates of freight where necessary, such voyages being arranged through the shipowners usual intermediaries—the shipbrokers.

By such a plan shipping will have neither a short-lived post-war boom period nor an otherwise inevitable far longer period of disastrous slump and shipbrokers will once again be given an opportunity of proving their worth to the nation.

Failing some such scheme as I have outlined, I see very little prospect of that hardworking and enterprising person, the shipbroker, ever being allowed to perform that for which generations of shipowners have gladly employed him—skilled and expert service.

War Problems — Continued from Page 103

ment without additional remuneration and against reimbursement only of the expenses of the organisations so devoted to the national needs.

Between the summer of 1940 and the early part of 1942, there were a number of increases in the operating expenses which the "basic rates" were designed to cover, and it was because of that fact that the whole position was reviewed last year. A year earlier an investigation into the working of the liner agreement had been made at the instance of the Ministry and had resulted in proof that up to that date the agreement had operated in accordance with the broad intention of its design.

By the end of 1941, it was clear to the British Liner Committee that it had largely ceased to do so, inasmuch as the basic rates were failing to meet the rising costs of operation, and were resulting in losses which were falling and could only fall, on that part of the rate intended to provide for depreciation and interest on capital.

It has intrigued me to read, in one or two quarters, criticisms of the fact that the liner companies have been given an "increase" in their hire—a criticism which could hardly have been made if the true facts had been understood by its authors. In fact, the only change in the conditions governing that part of the rate which is not related to reimbursement of operating costs has resulted in a reduction. It was agreed in the course of last year's review that when a ship attained a certain age, it would revert automatically to a lower value for purposes of calculation of the allowance for depreciation and interest, and in the case of those ships the requisitioned hire payable to their owners will hereafter be substantially reduced.

The increases which were agreed in regard to the basic rates were aimed solely at meeting, to the extent proved to be required, increases in the operating expenses of the ships that have taken place over the last two years, and by far the greater part of these basic rate increases is to cover the higher rates of pay on board the ships and in the repair yards that have come into existence during that period.

It is hoped that the new basic rates of hire will restore the position and permit the agreement to run undisturbed for a further reasonable period, but that is entirely dependent on the maintenance of the present levels of operating expenses. It is satisfactory to record that the relations between the industry and the Ministry of War Transport remain excellent, and that it has been possible by negotiation to revise the original agreement up or down in a manner fair to both the industry and the taxpayer.

It was customary in pre-war days for the chairman of the Liverpool Steam Ship Owners' Association to conclude this article with an incursion into the sphere of prophecy as regards the future of the industry. In present circumstances, any such attempt would be too venturesome. We have, if we are permitted the opportunity to take advantage of them, exceptional facilities for the building and running of the ships required for world trading. The share in world trade which we have secured in the past has depended, and will in the future depend, on the competitive value of the carrying power we have been and are able to offer in the world freight market. Given the will on the part of the nations to re-establish and extend the overseas exchange of commodities, I have no doubt as to the capability of British shipping to reap its fair share of the rewards of a better and more enlightened future.

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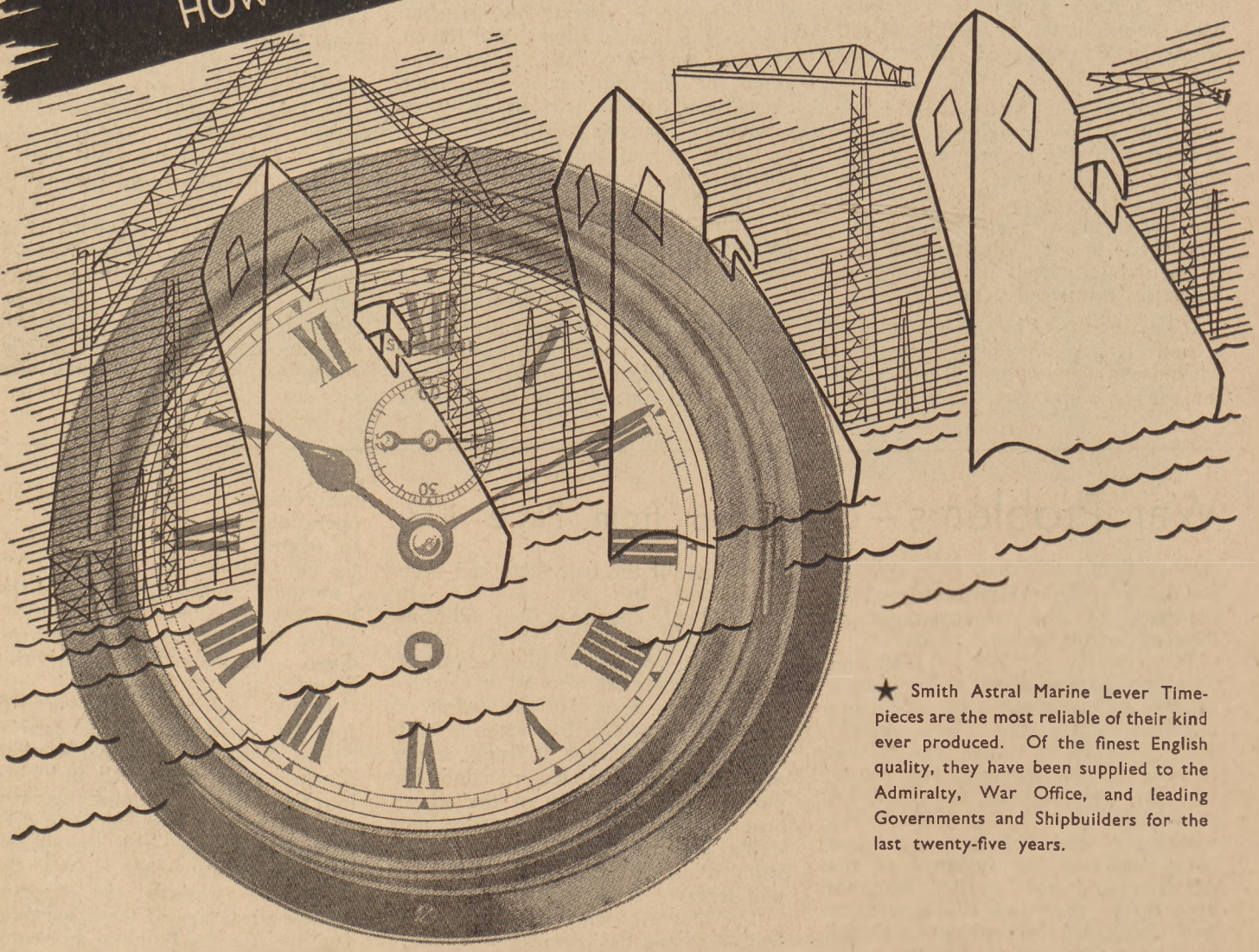

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A GLIMPSE AT THE ORGANISATION OF THE Ministry of War Transport

[By courtesy of "Picture Post."

Shipping Diversion Committee in session to decide at what ports inward ships will discharge their cargoes.

ALL our readers know by name the Ministry of War Transport, but few are familiar with its method of controlling ships, railways, road, and canal transport. It has, in its brief career, witnessed many changes, introduced many innovations; it has also borne and survived friendly if not always well-informed criticisms. It is now generally recognised that Lord Leathers, the responsible Minister, and those he has gathered round him have evolved a scheme of control and operation which is as comprehensive in its application as it is meticulously careful in its endeavour to do the right thing at the right time.

Among numerous other things, the Ministry has to divert ships to pick up the cargoes which are essential for our war industries and the weapons of war which are coming to us from the Arsenal of Democracy on the other side of the Atlantic, to get the cargoes to the loading ports, arrange for the ships to sail in convoy, decide upon the port of discharge, and get the ships unloaded as near as possible to the places where the goods are required, and without losing any time so that the ships can be given a quick turn-round to go out and bring in fresh cargoes.

This must appear a very complicated piece of machinery, but, by careful planning, all the different arrangements are co-ordinated and dovetailed and made to run smoothly and easily. There are representatives of the Ministry of War Transport in all the principal ports of our Allies and other countries to arrange the assembly of necessary cargoes for loading, and efforts are, of course, made to see that the individual cargoes consist as far as possible of goods for one particular locality in order to save inland transport by rail and road in this country and to avoid loading mixed consignments for consignees in scattered districts.

While the cargoes are still on the high seas the Ministry of War Transport receives from its representatives abroad full details of ships expected, the probable date of arrival, and the cargoes carried; and it is the duty of the Shipping Diversion Committee of the Ministry to see that arrangements are made for their arrival in this country, to select the port which is most suitable for discharge, bearing in mind the quick clearance of the goods and delivery to their destinations.

There are 35 to 40 members of the Shipping Diversion Committee, representing the various Services and Supply Ministries, port authorities, the Iron and Steel Federation, and inland forms of transport such as rail, road, short sea coasting trade and canals. From the other Government Departments are representatives of the Customs, the Ministry of Labour and the National Dock Labour Corporation; representatives from the American Army Transport Section also attend.

It is obvious that to exercise its control over seagoing ships, the Ministry must have accurate, complete and up-to-the-minute information about ships' movements, their capacities, dimensions and so on, and the Intelligence Department pursues its daily round with a quiet efficiency and imperturbability which has so often proved its high value to the war effort.

It knows, for instance, the position and direction of every important unit in the British, U.S. and Allied merchant fleets at any given moment. If it is asked where is the "Mary Jane" its reply is prompt and equally reliable. It may be asked how many ships are there in the Bay of Bengal, the Gulf of Mexico, or in Liverpool, and its immediate reply would be not only the actual number of ships but their nationality, tonnage and other details of prime importance. It is this accuracy of knowledge of the whereabouts of every ship on the Seven Seas, liners, tankers, tramps, as well as at berth or

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waiting orders, that constitutes the Intelligence Department as the very nerve centre of Allied transport activity.

Here in a London building is a long, low room, the fittings and furniture of which are designed as part of a unique combination of study, workshop and centre of control; one can almost feel the steady pulsation of the heart of the Ministry and witness the steady flow of the life-giving stream of information which is rapidly decoded and passed on to be recorded.

Much of the work of the Intelligence Division is performed by specially trained girls in teams. Each team is allotted an area, perhaps in the North Atlantic, the Indian Ocean or Pacific, but the whole of the seas are covered. Each team scrutinises telegrams, &c., as they arrive, records on geographic index cards the movements of the ship concerned and alters her position on the table chart until she passes out of their horizon into the area governed by the neighbouring team. These girls have become so efficient that the work of plotting a convoy or individual ship in the appropriate longitude and latitude takes but a matter of seconds.

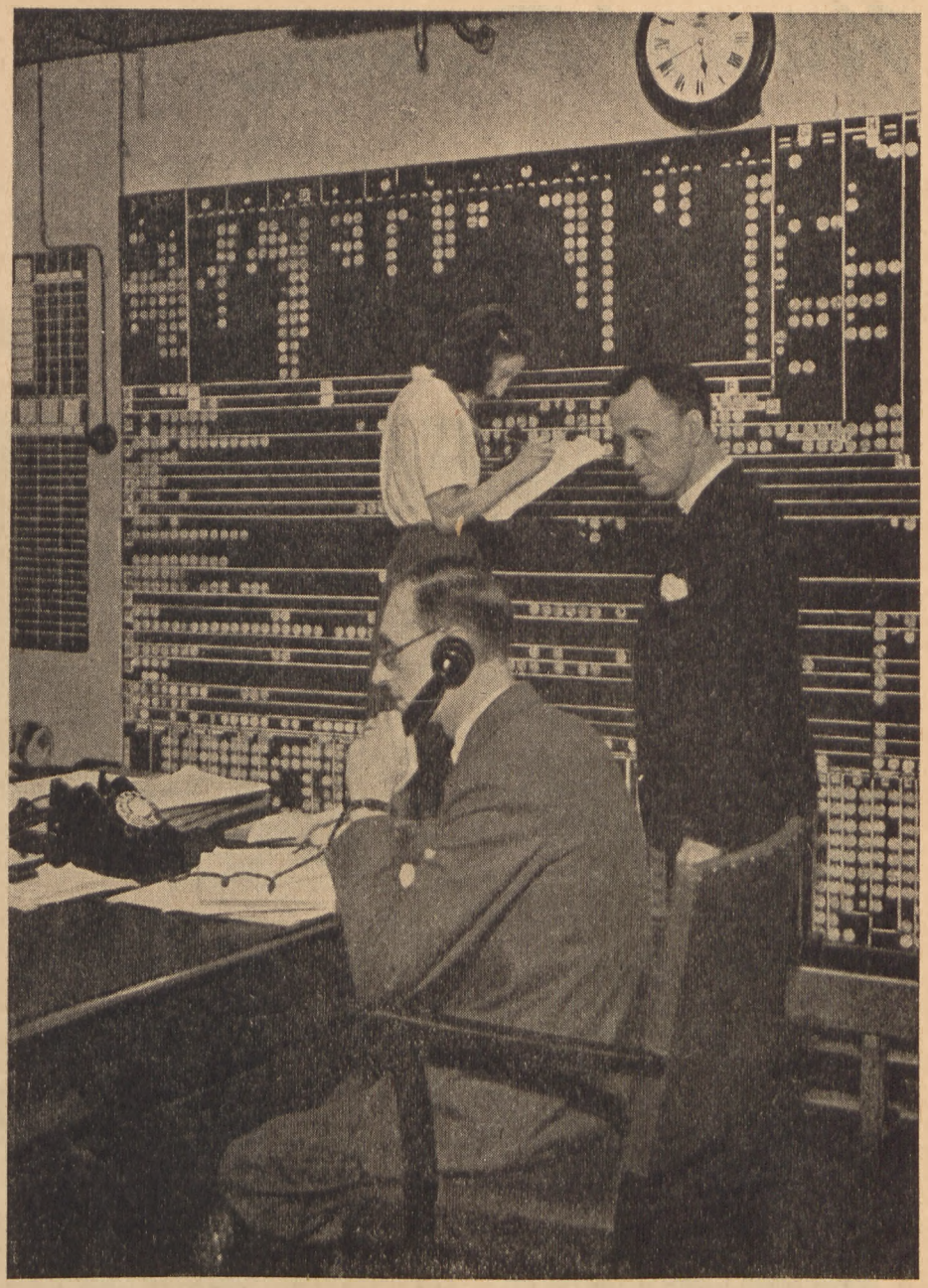
Tramps are treated in a rather different way and have their own index system. The method employed simplifies the work of allocation of tonnage as well as that of ship management.

On the departure of every tramp from a British port three cards are made out. The expected duration of the voyage having been ascertained, it is recorded and a coloured tab is snapped on to the first card. This indicates the month the ship should be available for reallocation.

Early in the penultimate month of the voyage, the position of the ship is ascertained and if she is likely to be available within the scheduled period, a second card giving the technical details of the ship, with cargo-carrying capacity, &c., is made out and sent to Allocation of Tonnage Division.

Precaution has, however, been taken to provide for all eventualities. These are covered by the third card, which is used for what is known as the "close watching" system. A number of symbols have been introduced, each indicating an eventuality or mishap that may befall a ship. If such occur the card is appropriately adjusted and the information immediately forwarded to the Allocation of Tonnage Division. How this smooth working scheme facilitates the departments concerned is obvious.

This and the visual chart system are invaluable adjuncts to the Ministry and provide immediate answers to inquiries. Much useful advance information is also provided regarding the approach of ships to any given point, which enables, say, the Liner Division to plan the re-allocation of available tonnage at any specified time. This background of reliability is obviously of the highest importance and value to the naval and military authorities, with whom the Ministry of War Transport works in the closest co-operation.



[By courtesy of "Picture Post."

After cargoes have been discharged, internal transport takes over and plans their distribution by coastwise shipping, rail, road and canal.

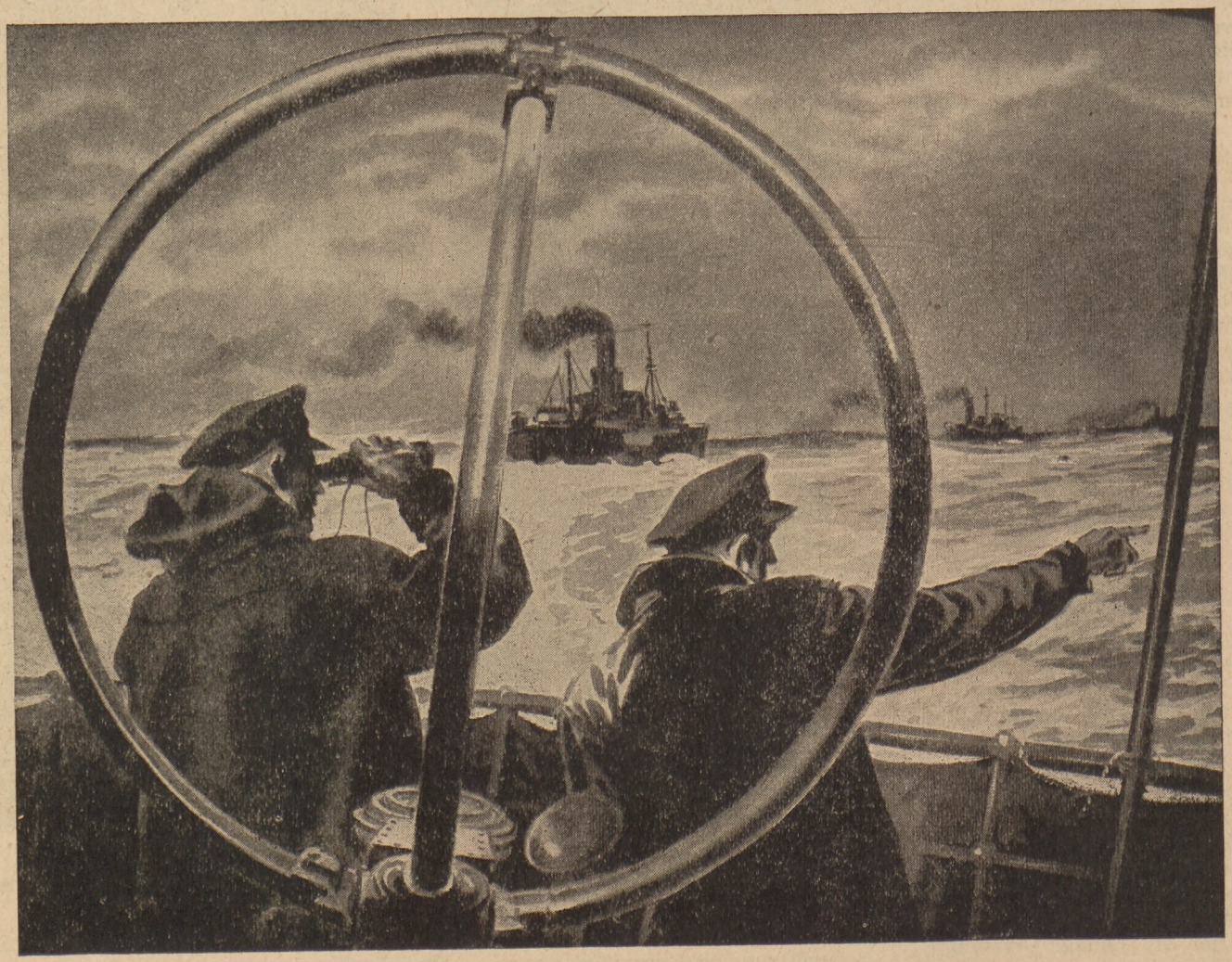
In addition to these important internal services, the Intelligence Division is responsible for the compilation and issue of a series of special returns, such as the daily list of arrivals and departures at overseas ports, the total tonnage mobilised for naval and military purposes, and of no less importance, a list of all sailings for the Post Office mails department.

The whole of this information is carefully analysed for the purpose of a monthly statement, which shows the employment of all British and Allied, as well as of neutral tonnage. It also gives the number of ships under repair.

How carefully balanced and controlled this very important information is, and how closely shipping secrets are guarded, received a well-earned tribute from the Prime Minister in his references to the great convoy that was so successfully assembled and despatched to North Africa.

Voice of Freedom

Across the oceans, in fair weather and foul, in war and in peace, wireless is the voice that safeguards the life-line of Britain . . . . warns, guides and directs convoys . . . . links the seafarers who are holding and will hold the outposts of freedom.



MARCONI

MASTERS OF MARINE COMMUNICATIONS

THE UNITED NATIONS' MERCHANT NAVY POWER

IN the Merchant Navy's share of the fight against the Axis, British ships are strongly reinforced by the ships and the shipping organisations of the Allies and of most of the occupied countries. Each, in the manner indicated by its own national characteristics to be the most suitable, is striving to lend its help in the attainment of ultimate victory.

So as to present to our readers a picture of the extent of this assistance we invited representatives of the shipping interests of

Belgium	Denmark	Fighting France	Greece	Jugoslavia
Netherlands	Norway	Poland	Soviet Russia	United States

to give a word picture of what each country is doing. Their articles, plus a letter from M. Maisky which is printed overleaf, vividly portray what the seafarers of other nations are doing to help in the common cause and provide telling testimony to their unflinching courage and tenacity. How successful have been their efforts and determination to maintain the freedom of the seas is demonstrated by the fact that raw materials for our workshops as well as food are brought from the far corners of the world and the troops of the United Nations are being supplied with the weapons, munitions and resources for the achievement of victory.

In passing it may be mentioned that much is being achieved at British ports to make the men as comfortable as possible while their ships are in dock and in some measure to fill their yearning for home. Of one's own experience it is safe to say that one of the things that foreign seafarers appreciate more than anything else is being invited into one's own home, to sit in front of the fire (carefully tended to hit the fuel target) and so enjoy for a few hours the peace and comfort of the home that is temporarily denied them.

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12th December, 1942.

The Soviet Navy and Merchant Marine are playing an essential part in the fierce struggle against our common enemy. Together with the Red Army, under the command of M. Stalin, the men and women who sail the ships of the U.S.S.R. are striking forceful blows for victory, and they are an indispensable factor for its achievement.

Besides carrying cargoes to and from other countries, the merchant marine of the Soviet Union serves the vast navigable inland waterways of the whole U.S.S.R. Alongside their brave British, American and other Allied sea-faring comrades-in-arms, Soviet sailors are defying the enemy U-boats, aircraft and mines, successfully crossing the oceans of the world bringing arms and munitions safely into Soviet ports. They are taking timber and other materials from the Soviet land to assist the war production of the Allies.

Not only Soviet citizens serving in the Soviet Fleet and merchant service, but also ships, have been decorated "for exemplary execution of Government orders for the delivery of munitions from abroad." Soviet women also captain their country's ships and form quite a large proportion of the crews. The historic defence of Odessa, Sebastopol and Leningrad; the epic resistance of Stalingrad which has altered the whole course of the war and now the counter-offensive which is quickening the hearts and steeling the will of all freedom-loving humanity - all this owes an untold debt to the tenacity, heroism and selflessness of our sea and river forces.

Thus, the ocean and river-bound services of the U.S.S.R. are able to make a valuable contribution towards the final victory of the United Nations.

I. Maisky

Ambassador of the U.S.S.R.
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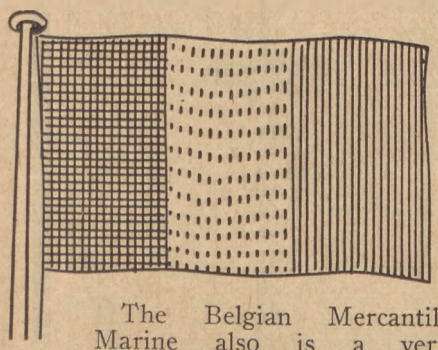
THE BELGIANS IN THEIR SECOND WORLD WAR

AMONG the small countries engaged in the struggle against the modern form of Germanism, Belgium is the only one to have fought also in the first world war. Last time, when the Allies retained a fighting front in Western Europe, the contribution of Belgium was chiefly military, although the Belgian Congo and the Mercantile Marine also played their important part.

This time the Belgian Army, like so many others, having been overcome, the country entirely occupied, the handful of Belgians who managed to escape the tide of German invasion are continuing the struggle from Great Britain and from the Belgian Congo.

Besides serving in the armed forces of the United Nations or otherwise participating in the war effort in a civilian capacity, the Belgians have brought into the struggle two important assets: the immense resources of the Belgian Congo and the services of their Mercantile Marine.

The Belgian Congo is a very different place from what it was in 1914. The development of its vast resources has been important and rapid. The production of its chief products—copper, copal, palm oil and cotton—has increased enormously. With the loss of the Pacific possessions of our British and Dutch friends, its significance as an exporter of these vital products has increased still more.



The Belgian Mercantile Marine also is a very different one from what it was 25 years ago. Despite the importance of the port of Antwerp, one of the four biggest in Europe, the Belgians, strangely enough, have never been a seafaring nation. Their Mercantile Marine has always been and is still small in size. Yet technically many advanced achievements in shipbuilding and marine engineering, shipowning and seamanship, stand to their credit. The "sea animals" amongst us are not numerous but, perhaps partly because of that, they form an active and progressive body.

During the last decade before this war a big change occurred in Belgium. The public and the Government discovered they had a Mercantile Marine. By joint action of some advanced Government officials and the leading shipping companies, a rejuvenation of the fleet was started. It was in full progress when the war put an abrupt end to it.

All the new ships were designed in Belgium by Belgian naval architects and marine engineers on the most modern lines, aiming not at prestige performances but at the highest possible commercial efficiency. Not all the ships were built in Belgium because the programme exceeded the building capacity of the country, but many were built in Belgium and equipped with Belgian engines and auxiliaries. In fact, in the last five or six years before this war, the Belgian industry as a whole made a spirited and successful attempt to produce marine specialities of all descriptions.

When Belgium violently entered the war on May 10, 1940, a part of this new fleet happened to be in Antwerp. But we were prepared for the blow. it was not unexpected. All precautions had been taken in advance and the next day the entire fleet sailed down the Scheldt in bright daylight, having on board their managements, shore staffs, archives, spare parts, even machine-tools from their repair shops. This fleet was attacked from the air but only one vessel, which left a little later, was hit and sunk. All the others arrived safely in friendly French waters.

The second escape, from France, was however not so successful. Most of the vessels got away, but the bulk of the managements, staffs, records, spares, had to be left behind. The very few that escaped started afresh, almost from nothing.

All the vessels were requisitioned by the Belgian Government, but the Belgian owners are also represented in Great Britain. Through the close connections they had before the war with the British shipping world, they managed to obtain licence to retain the technical control of their own vessels. Of course, all are at the service of the Ministry of War Transport; they are also indirectly controlled by the Belgian Government, but the Belgian owners operate their own vessels, very much like British owners.

This enables the Belgian Government and the Ministry of War Transport to make use of an existing technical and commercial organisation that is purely Belgian. It is a good example of private enterprise at the service of a national effort.

The Belgian merchant fleet is small. Yet it comprises a good number of first-class modern passenger, passenger and cargo, and cargo liners, many of them motorships. The passenger ships, of course, are now troopships; the others, besides their routine job of carrying cargoes across the Atlantic or to and from the Belgian Congo, have

By G. A. DUFOUR,
Superintendent to the Cie Maritime Belge

been many times selected for special jobs on account of their speed, equipment and general efficiency.

One of them was the first merchant ship to enter Algiers harbour recently, where the population, impressed by the fact of all Allies participating in the expedition, shouted to our men "Vive la Belgique."

Another, torpedoed in the Atlantic, did not sink immediately. Although she was on fire and loaded with explosives, her crew managed to save her and to bring her to port under her own power. This is only one of many gallant actions that our seamen have in common with the other Allies. From time to time news of such actions is released in the Press, but I wonder whether the public appreciates how many others are never mentioned. They are part of the job.

The Belgian ships are still manned by their original crews, escaped with them from Belgium. Many of our men have had two wars at sea. Some of our older captains are for the second time in wartime command. Like the other Allies, the Belgians have their crew problems. Rest centres and homes have been created by the Belgian Government for men in bad health or on leave. The legal statutes and social benefits had to be revised and adapted to the lives of our men in this country, far from their families and homes. This was a big task that has been completed under the supervision of the Belgian Government by the shipowners and seamen's unions in the best spirit of collaboration.

All Belgians, of course, are anxious to see the end of this gigantic struggle that will free their families from the oppression of the enemy and the danger of starvation. But, because of her share in the battle of oversea transport, all hope also to see Belgium playing after the war a bigger part in the world shipping than has been the case before and produce still better men and ships.

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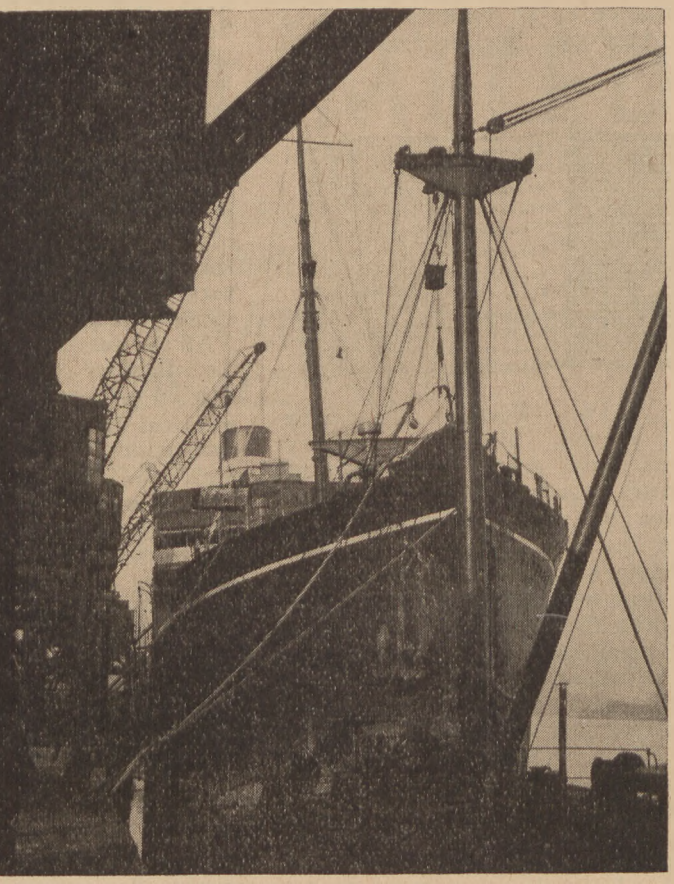


DENMARK'S MARITIME PURSUITS IN WAR

By the Press Attache to the Danish Legation

WHEN Denmark entered the war, that is when she was attacked without warning on April 9, 1940, despite a short-lived but long-termed treaty of non-aggression, offered by Germany and accepted by Denmark, there was little Denmark could do beyond mobilising such of her people and her assets as remained out of German reach. The most valuable of her assets for war was her splendid fleet of merchant ships.

Denmark has always been a seafaring nation, and from ancient times the Danes have taken kindly to the sea. As in the last war, Danish ships were well to the fore during the first year of the present struggle, when Denmark maintained a precarious neutrality. But neutrality does not protect ships against U-boats, and already in that first year of war the German Moloch of the under-seas demanded and got his sacrifice.

After an unusually hard winter there were more ships marooned in Danish harbours than we could have wished for, but a good third of the fleet was scattered over the seas when Germany struck and sent out through the Danish and her own radio her vain call to lure Danish ships on the high seas back into her power.

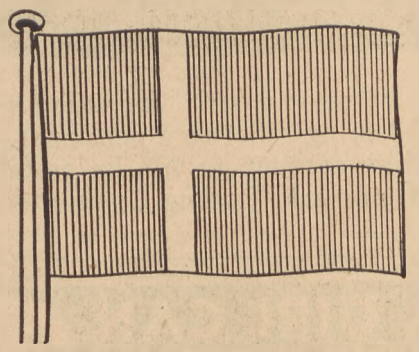
The overwhelming part of these ships, about 4-500,000 tons of them, preferred to set course for British ports They were manned by about 4-5,000 Danish seamen, and thus it came about that Denmark from the very first day, in no inconsiderable measure, was able to help where shortly help would be most needed.

Many of these ships and their crews are no more, but the inevitable losses have in some measure been compensated for by the bringing into the service of the United Nations those ships which were lying immobilised in countries that have since come into the war on Britain's side. The latest example is North Africa, where several Danish ships became available.

A sailorman is an adaptable creature, and he has need to be. We who shuddered a little at the unaccustomed vigil of an occasional fire-watch in the wind and rain and the bleak silence of a wintry night learnt to regard them as a boon when there were no bombs about, and even so a sailor learnt from his first voyage to take the rough with the smooth and to regard his many vicissitudes with a calm born out of a simple faith. He knows that everything in life goes by the way of contrast, that out of a storm fair weather is born. He knows that there is no peace without a fight and that composure can only be gained when tempest is faced and fought.

In the Danish sailors' blood runs the leaven supplied by his battling ancestors. So when war came to him, and he could not fight for his own country directly, he was not long in doing it indirectly. His ships were fitted with the auxiliary weapons of war, and he was ready for the fray. If a Danish ship was not available he went in a British.

The heritage from his fighting forbears which fitted him for trial and tribulation was also responsible for his distrust of war; he had learnt to fear and abominate the futility and waste of useless bloodshed. But here was a situation which anyone could understand, a clear-cut issue between two worlds of thought: Germany with her insane lust of domination, her craving for a dark new gospel at



the expense of her fellow-nations, Germany who robbed Denmark in the vividly remembered wars of not a century ago—and Britain with whom Denmark, it is true, has also fought wars in earlier days, but who had helped Denmark to regain part of her own in the last world war, and whose way of thinking and acceptance of the rights of man were much like his own. The choice was not difficult.

And so it came about that Danish seamen and Danish ships took their appointed place in this final clash, which will also decide Denmark's destiny.

Goods have to be carried in peace and war, and most particularly in war when one of the main purposes of the belligerents is to procure supplies for themselves, and preventing them from reaching their enemies, and it is of course especially the delivery of supplies with which the Danish ships and sailors are concerned. Food, munitions of war—every imaginable commodity needed in the conflict—are being carried to and from the wide-flung theatres of war.

But it is not only in the more passive fighting—if indeed the war of to-day can ever be termed passive—that the Danish seamen take part. They are to be found in several branches in the Navy too. We have been told of Danish ships taking part in the great expedition to North Africa. There were Danish sailors in the raid at Lofoten. When they went out they were 52 on board, but they came back with 124. The new additions were people from Lofoten, who eagerly grasped the opportunity of placing the seas between them and the Germans.

Another Danish ship was at Crete as a supply ship for British forces. Eventually she was hit and blasted by four bombs. This crew had quite an adventuresome journey before they got safely away from the island.

But as events go in these days, adventures become commonplace and always pale for somebody else's. Important is only the spirit which binds these Danish sailors and, for that matter, soldiers of ours to their British comrades in arms. The torch is lit and its flame is pure and unextinguishable.

In Denmark, where the Danish seamen have their near and dear ones, where only the echo is heard of the battle through the British radio, punctuated sometimes by the sound of British bombs and German cannon, the people wait anxiously but confidently for the day of delivery. They are proud of their fighting Danes, who have shown the red and white of the Dannebrog and have given their all without asking the price.

No record of the Danish war effort is complete without mentioning the brave little fleet which the Danish fishermen took across to British shores. They, too, left their homes and families behind, and they are still being joined by others who take the "wrong" course when out on the fishing banks and an opportunity offers. Their staunch little cutters now fish in British waters and bring back their catch come hell or high water.

The Danish seamen have their home from home in Newcastle, where they now have their own club with its newly-opened Danish library. There, too, are the offices of their unions and their newspaper the "Kurer." The Danish Legation and Consulate-General, and the Danish Council in London are keenly interested in the welfare of our seamen. They know what a burden they carry and realise that what can be done to lighten it should be done.

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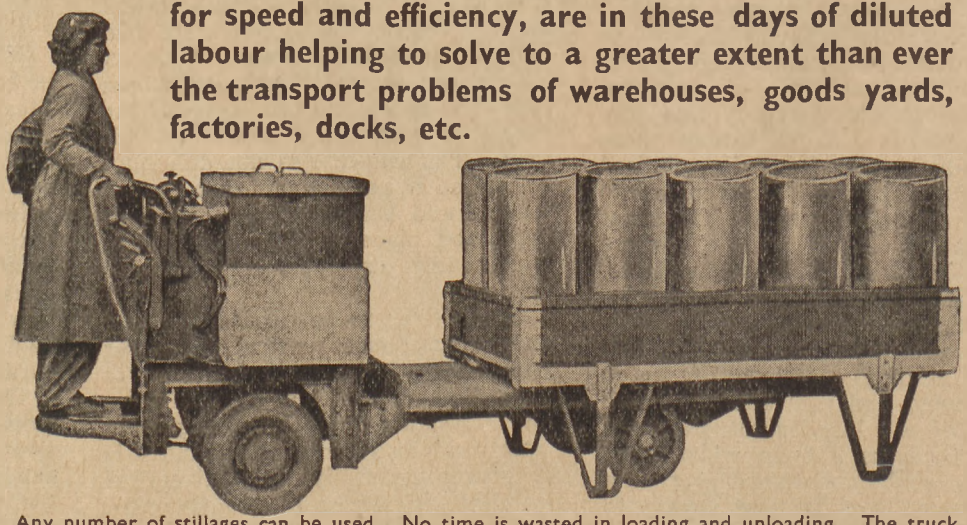

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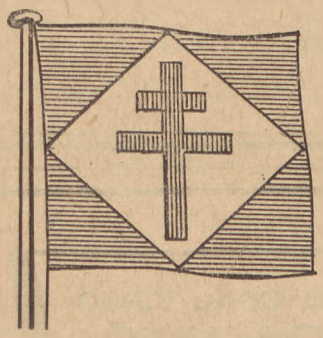
THE FIGHTING FRENCH CONTRIBUTE OVER 100 OCEAN-GOING SHIPS

MORE than one-quarter of the French Merchant Navy is now in the service of the Allies. To-day over 100 ocean-going French ships sail in the same convoys as do the British and Allied merchant ships. Some 5,000 French seamen have rallied to the call of General de Gaulle; the younger men are serving in the Fighting French Navy, thus leaving the older men to provide crews for the merchant vessels. These brave and sturdy seamen are a goodly race of men and many are the deeds of valour that stand to their credit. Many have been decorated for individual acts of courage and many, alas, have paid with their lives for their patriotism. Many have risked their lives in escaping from France to join the Allied cause and their number is being added to almost daily.

The problem presented itself when the Fighting French Mercantile



Marine was being formed in June and July, 1940, as to whether these ships should be temporarily merged in the British Merchant Navy or should form an independent French fleet, subject only to the control of the Fighting French authorities. The Ministry of War Transport and the direction of the fighting French Mercantile Marine finally decided that the vessels of this fleet should be managed by various British shipping firms of experience and high repute. The employment of the vessels would be decided by the Ministry in consultation with the direction of the Marine Marchande. The latter also acts in an advisory capacity on questions of manning those vessels having French crews. The welfare of the men is also the concern of the direction of the Marine Marchande. Hostels have been established at Cardiff and Liverpool and there are four excellent clinics, where French doctors look after men who are ill.

It has been the aim of the Marine Marchande to maintain the national character of the French commercial fleet so that it can be handed back to its rightful French owners at the end of the war.

The British Government has undertaken to pay to the owners hire for the vessels for the period during which they have been under requisition. The ships will also be put into the same state as they were when taken over and owners will be compensated suitably for those vessels lost through marine or war perils. This undertaking has been broadcast to France, so that owners there can have no fear that they will not be paid for the time the vessels have been serving in the Allied cause.

Vichy issued instructions that French vessels were to be scuttled rather than that they should be taken over by the British. French owners must surely see quite clearly that the solemn undertaking of the British Government to restore their vessels at the end of the war, or if they have been lost by war or marine peril to pay compensation for those lost, and to restore the vessels in class at the end of the war, is worth far more than is a claim against the Vichy Government for vessels that have been scuttled. Apart from the monetary consideration, surely there can be no French owner who would instruct his masters to scuttle their ships rather than that they should continue to help toward the final liberation of France.

In addition to the ocean-going fleet, which includes the large liners *Ile de France, Pasteur, Felix Roussel,* the last named escaped from Singapore, there are many coasters, trawlers and fishing boats, all of which are doing useful work. A certain number of vessels have been placed in the service of those French colonies which have rallied to the cause of Fighting France. Now that North Africa is in the hands of the Allies, more French tonnage will be taken over and the vessels held in trust for the rightful French owners.

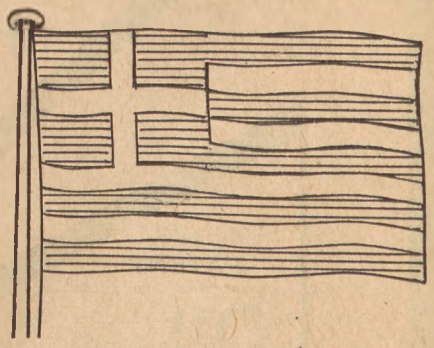
The Fighting French seamen are keeping the flag of France honourably over the high seas, alongside their Allied comrades. Many French seamen have paid for their devotion with their lives but they have written another of the glorious pages in the history of French courage and endurance.

The tide is turning and the day is not far distant when more and more vessels will rally to the flag of Fighting and Free France and play their part alongside those hundred ships and their seamen. which have borne their share ard more towards the final victory of the cause of freedom and the restoration of the glory that was France.

THE MERCHANT NAVY OF GREECE

By the Chairman of the Greek Shipping Co-operation Committee

GREECE with its long coast line and many islands has been from immemorial times a seafaring nation. Since the foundation of the Greek states and the establishment of colonies along the whole coast of the Mediterranean and the Black Sea, Greek sailing ships carried all sorts of merchandise from the metropolitan states to the colonies and vice-versa. With the Roman occupation the Greek mercantile marine at that time began to decline.



Later, in the times of the Byzantine Empire the Greek ships were again sailing along the routes of the Eastern Mediterranean for many hundreds of years, but since the occupation of Greece by the Turks, new powers took over the command of the Eastern Mediterranean—Venice and Genoa; then towards the end of the 18th century and the beginning of the 19th century, Greek sailing vessels began to carry cargoes (some ships under Russian flag) from the Black Sea ports to the Western Mediterranean. These same ships—during the Greek War of Independence—became the warships which fought so gallantly against the Turkish navy. After Greece became a free state the Greek Merchant Navy grew steadily and gradually to one of the most important resources of the Greek nation.

At the beginning of the last war the Greek Navy consisted of 485 ships, gross tonnage 836,000; at the beginning of this war it consisted of 607

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ships, gross tonnage 1,780,000. Of these, 319 were cargo vessels of over 3,000 tons with a total tonnage of 1,485,000.

With the outbreak of the war but long before Greece was involved in it herself, a considerable number of these vessels were voluntarily placed at the disposal of the Allies. A time charter between the British Ministry and the Greek Shipping Co-operation Committee came into force at the beginning of 1940, under which every Greek ship had to fulfil a certain period of service. the conditions of rate being below the market level. Many of the Greek ships were also time chartered to the French Mission and the remaining vessels were executing voyages under charter to Great Britain and her Allies.

With the entrance of Greece into the war all Greek ships were requisitioned by the Greek Government and put at the disposal of the Ministry of Shipping under a new time charter concluded in May, 1941. As a matter of fact many Greek shipowners living abroad forestalled these measures and shortly before the occupation of Greece instructed their London representatives to offer their steamers to the British Government direct.

Since the beginning of the war Greek ships have been carrying food, ammunition and other cargoes (especially minerals, from across the Atlantic) to this country and all the places where the Allies are fighting. In the Mediterranean Greek ships, especially passenger steamers, played a great part in the carrying of troops during the evacuation of Greece and Crete. The majority of these were lost and a considerable amount of cargo tonnage also destroyed. During the long siege of Tobruk small Greek vessels escorted by Greek destroyers played an important part in supplying and reinforcing the garrison.

The number of Greek steamers lost is considerable and it is improbable has sustained comparatively equal that any other Allied Merchant Navy losses, thus hundreds of Greek sailors lost their lives in doing their duty for the Allied cause.

Right from the beginning of the war and without state interference Greek shipowners, appreciating the dangers to which the crews are exposed, granted high wages to the personnel of their ships. The present wages of Greek seamen are the highest amongst the Allies after the Americans. An A.B. gets £28 per month and every six months an extra bonus of £20. In the event of war accident, they are, of course, provided for by the Geneva Convention, on top of which they get an extra bonus of £20. Crew's maintenance has always been costly and has now reached the rate of 7s to 8s per day per head as compared with 3s 6d per day per head in British ships.

At the outbreak of war the Greek Government established a special fund for the protection of the Greek seamen against war risks. Such high rate of wages and benefits cannot be justly appreciated without taking into consideration the low standard of living and the low scale of wages prevailing in Greece.

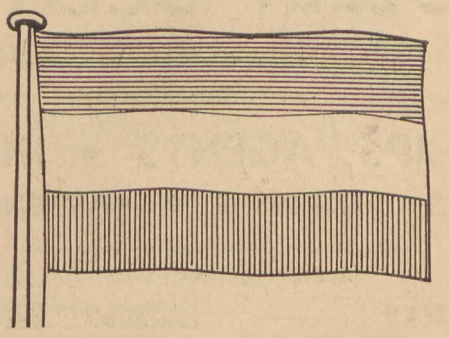
It is hoped that this brief analysis will make it possible to appreciate the importance of the contribution of Greek shipping to the war effort. Greek shipowners are looking forward to the time of their country's liberation, when they hope to contribute to the United Nations' effort to reconstruct a free and prosperous Greece.

JUGOSLAV SHIPS PLAY THEIR PART

SINCE the declaration of faith of March 27, 1941, which Mr. Churchill designated as "Jugoslavia finding her soul," and especially since the German invasion of April 6, 1941, there has been total war for Jugoslavia. The apparent swift military collapse will be explained by historians and sociologists and students of military affairs. But the fact of the resurgence of Jugoslav military power under General Mihailovich in June, 1941—a power growing ever more strong and more formidable—still astounds and will continue to astound the world. Thus at home in every sense of the word Jugoslavia has not ceased to fight an active war against her Axis enemies and their agents.

The military collapse and the geographical situation of the country precluded the escape of any large numbers of people or soldiery from the country, as was the case with Poland and Czechoslovakia. Thus, numerically, Jugoslavia has no great army, navy or air force outside.

In shipping, however, the case is totally different. Jugoslav shipping has since its earliest days been closely interwoven with British shipping, and the sympathies of Jugoslav shipowners and personnel manifested themselves openly in favour of the Allied cause whilst strict neutrality was still the official watchword of South-eastern Europe. As soon as Great Britain declared war on Germany, the most prominent Jugoslav shipping company voluntarily hastened to put at the disposal of Great Britain 10 of its ships, totalling 49,767 gross registered tons, chartered for the duration of hostilities. This unneutral act was warmly greeted in British official circles and



will not be forgotten in the future relationship of Britain and Jugoslavia on the seas. It was this action which was to lead to subsequent chartering of all neutral tonnage to Britain on the safe or similar bareboat basis. Thus, still prior to the invasion, Jugoslavia was to charter a further 36,657 gross tons, bringing its total on charter to Britain up to 86,424 gross tons.

Of about 70 ocean and sea-going merchant steamers that Jugoslavia possessed at the time of the invasion, totalling about 300,000 gross tons only eight were seized by the Italians, of which only three were ocean-going, the others being for coastal and Mediterranean trade. One of the largest of

By I. S. IVANOVIC,
Overseas Navigation Trust, Ltd.

these, which was caught at Oran, was given to the Italians by Vichy and subsequently sunk by a British submarine. Many coastal steamers were scuttled in Jugoslavia as soon as it was realised that the Axis had achieved sudden mastery.

In fact, only an unknown number of small coastal steamers incapable of navigating the high seas fell to the Italians. Four larger coastal passenger steamers which carried the bulk of the Dalmatian tourist trade are also at the bottom of the sea, two sunk during the invasion period and two subsequently early in 1942 through Allied action, and are thus out of the clutches of the Italians. Thus, as far as regards shipping, Jugoslav tonnage was a positive contribution to the Allied cause.

It is owing to the initiative and foresight of Jugoslav shipping companies that this fortunate state of

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affairs occurred. Jugoslav shipowners had foreseen such contingencies and had in good time set up organisations in London and New York with trained personnel on the spot to take over management in case of disaster at home.

Since April 6, 1941, Jugoslav tonnage has been dedicated wholeheartedly to victory in accordance with the United Nations' declaration signed in Washington placing the resources of all participating governments unreservedly for the cause of freedom. The Jugoslav Government requisitioned the use of ships for the duration of hostilities, and in co-operation with shipowners, a working agreement has been reached with the Ministry of War Transport which is soon to be formalised by the contracting parties. Jugoslav merchant vessels are engaged mainly in five theatres of the sea war :—

1. North America to England.
2. North America to South Africa and India.
3. Caribbean.
4. Australasia.
5. North and South America.

Ships often deviate from these main zones to supplement world shipping to the Red Sea, Persian Gulf, or wherever necessary—but in the main Jugoslav ships stick to the routes indicated. Their cargoes are diverse but generally they bring raw materials to the arsenal of democracy and from it they ship finished articles and materials of war wherever necessary.

The organisations concerned with Jugoslav shipping have their location both in America and Great Britain. In New York there is a Jugoslav Shipping Committee, consisting of a shipowners' committee and officers' and seamen's representatives whose task it is to represent Jugoslav shipping collectively, to arbitrate disputes and to form a clearing ground for Jugoslav shipping generally. With the arrival of the Jugoslav Government in London and its greater attention to shipping, many of these tasks have now been taken over by the Jugoslav Ministry of Transport which is soon to establish a branch office in New York. The officers' and seamen's unions were invited to London by the Jugoslav Government in order to make a new collective agreement between shipowners and seamen employed on board the ships.

London is becoming more the centre of Jugoslav shipping. There, there is also a Jugoslav Shipping Committee, founded at the same time as the New York Committee, with similar functions forming an expert advisory body in questions of shipping for the Jugoslav Ministry of Transport.

Losses up to date have been severe, both at home and abroad, but Jugoslavia will have her due share in the general allied replacements scheme, and there is no doubt among Jugoslav shipowners that in the post-war settlement Jugoslavia's sacrifices will be recognised by her Allies.

WAR EFFORT OF THE NETHERLANDS MERCANTILE MARINE

By DIRK HUDIG, Chairman of the Netherland Shipping and Trading Committee,

I HAVE been asked to write a few words about the Netherlands mercantile marine and its work in the Allied cause since the occupation of the Netherlands. Before doing so, I should like to say something about the Netherlands shipping organisation which was established here upon the invasion of the Low Countries.

Organisation

As one of those entrusted by the Netherlands Government in 1940 with the control and direction of the work of the Netherlands merchant navy, the first few days of that period are still clear in my mind. In consultation with the Royal Netherlands Government, at that moment still in The Hague, it was decided to set up in London a special organisation, composed of a few Dutchmen who happened to be available and who had wide experience of Netherlands shipping work. This organisation, "The Netherland Shipping and Trading Committee," under the auspices of the Royal Netherlands Government, then took control.

When Hitler invaded Holland, almost the whole of the Dutch merchant fleet was dispersed over the oceans, but luckily in close co-operation with our Government, we were able to arrange within 24 hours of the first attack that all captains defied the German wireless order to proceed to Axis or neutral ports: moreover, a great number of those ships which

Mr. Dirk Hudig

were in the harbours of Holland managed to escape, despite constant bombardment by the Luftwaffe.

The committee first adapted and equipped the ships to meet the changed conditions and then operated them in close co-operation with the British authorities in the mutual interests of the Allied cause although part of the tonnage had to be reserved for the vital communications between the Dutch East Indies, U.S.A., and other Allied countries, as well as for the important inter-island traffic of the Netherlands East and Netherlands West Indies. Since the Netherlands East Indies have been overrun by the Japanese this tonnage is also operated in the immediate interests of the war effort.

On June 5, 1942, the Royal Netherlands Government, through the Minister of Trade, Industry and Shipping, changed the status of the Committee requisitioning the possession of the entire Dutch merchant fleet, thereby appointing this committee to act as "ships' husband," which means that the commercial and technical management of that fleet, under the responsibility of the Minister, remained entirely in the hands of this committee, including the care of and co-operation with the roughly 20,000 resolute Dutch seamen who man the fleet.

These men have added many heroic pages to the long record of courage which has made seamen of the Netherlands famous in the past, maintaining that great tradition which at one time made them the successful fighting opponents of the British and other nations, at whose side they now gallantly stand.

For more than two years now this huge fleet, the tonnage of which I cannot disclose, has worthily participated in the great epic of the oceans, and a lasting name in history has been made by the Dutch seafaring heroes of the

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Battle of the Atlantic, Crete, Malta, Tobruk, Java, Archangel and the Mediterranean, where in all battles and convoys they have played a conspicuous part, as a testimony of which Queen Wilhelmina has decorated more than 300 Dutch seamen for bravery; the services of many of them have been equally recognised by the British Government, which has conferred on some of them the O.B.E. and other commendations for bravery.

On the wall in front of my desk I am proud to have a framed letter written by the First Lord of the Admiralty to our Government:—

"The Commander-in-Chief, Mediterranean, has already paid tribute in one of his messages to the great part played by the Allied merchant vessels in the evacuation of the Imperial Forces from Greece. I should like to place on record my own admiration of the work performed in the course of these operations by the Dutch Merchant Navy. Would you be good enough to convey my appreciation to the appropriate authorities?

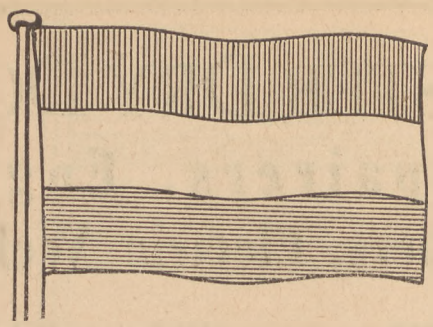
I desire also to express my sympathy with the casualties which your brave crews suffered throughout the performance of this task. The example of these devoted men will be an inspiration to everybody in the common cause and a guarantee of the ultimate victory of the arms of the Allied Nations."

I am proud to place on record the admiration we all have for the work performed in the course of these many operations.

Services Rendered by the Fleet

Although I am naturally not allowed to divulge the tonnage now engaged in the Allied war effort, I may state that notwithstanding our severe losses in men and ships this tonnage is still a very substantial one, its aggregate total lying between one and two million tons, in which the coasters, trawlers, and the well-known Dutch liners, all play their important part. Or, if I were to place the services performed in another light—it is of interest to note that since the invasion of the Netherlands our merchant fleet has carried more than 3,000,000 tons of foodstuffs, war materials, &c., to and from British ports, quite apart from the services rendered before the occupation of the Netherlands East Indies, in the carriage of valuable war materials, such as rubber, copra, &c., from the Indies for the American war industries.

The Netherland Shipping and Trading Committee Ltd. has done more



Interest Taken in Seamen's Welfare

than manage Dutch ships: it has supplemented that work by establishing a pool of Netherlands seamen. When ashore, whether in Great Britain or Allied countries, these seamen are well housed and supplied with the best possible amenities, whilst for the wounded and sick, hospitals and convalescent homes have been established.

Despite war difficulties, working conditions of Dutch seamen have been improved; wages have been raised, arrangements have been made to continue the operation of the accident-insurance law which was in force in the Netherlands prior to the invasion; a system has been devised enabling seamen to continue their nautical and engineering studies. Schools have been established, where they can go in for their promotion examinations. As far as their protection at sea is concerned, lifesaving appliances, equipment of lifeboats, &c., all meet the highest standard of efficiency.

Our Goal

Why do our sailors and all Dutchmen who have been forced to live in exile remain at their post? It is their love for their country, because they are determined to regain the freedom of their fatherland as quickly as possible and because they know that their friends and relatives in Holland do not expect them to do otherwise than fight for their country. Therefore they are willingly accepting risks and enduring hardships in their mighty crusade against the unprovoked aggression of their enemy.

We are not out to extirpate anybody. We have every confidence that we shall be able to create a better economic and social order, built upon the principles of freedom and of respect for the human personality. This being our goal, our men are fighting for the liberation of their country, the return of their beloved Queen Wilhelmina to her own people, knowing that

"Nederland zal herrijzen"

"The Netherlands shall rise again."

NORWAY'S CONTRIBUTION TO VICTORY

PROBABLY no country has had its national economy and welfare so closely bound up with the sea as Norway. Since the dawn of Norwegian history, the prosperity of the Norwegian people has been a function of maritime vitality. The Viking Age was a sea age, when Norsemen sailed their ships from Iceland to Constantinople, and the present age—another great age for Norway—has unmistakably shown how progress in Norway is inextricably linked up with sea-development. In the 20th century it is as true as ever before that Norway's life-blood flows along the sea-lines of the world.

It was therefore natural that, when Norway took her place alongside Poland, Great Britain, and France, the Norwegian war-effort should be largely a sea-effort. The bitter pill of military defeat in Norway was somewhat sweetened by the knowledge that 1,024 Norwegian merchant ships were beyond the grasp of the Nazis and would continue the fight from abroad. These ships, without exception, obeyed the orders of the legal Norwegian Government and entered the service of the Allies. Thirty thousand seamen and a fleet of about 5,000,000 gross tons thus came over to the Allies. Until the entry of the United States into the war, the Norwegian merchant fleet was the largest of the Allied fleets next to Great Britain, and the Norwegian Government has been able to make a contribution to the war effort which must surely be unique among "exiled" governments.

It is, of course, impossible to estimate the exact influence exerted by the additional 5,000,000 tons of Norwegian shipping on the course of the war. It should be remarked, however, that the value of this fleet cannot be gauged merely in terms of tonnage. It is generally agreed that Norwegian shipping leads in modernity and efficiency; the average age of Norwegian ships is lower than for any other nation and, moreover, these ships are specialised for particular trades to give the utmost service.

Above all must be remembered the great proportion of tanker shipping. At the outbreak of war there were over 2,000,000 gross tons of Norwegian tankers, or about a fifth of the world's total. The importance of the Norwegian fleet is made inesti-

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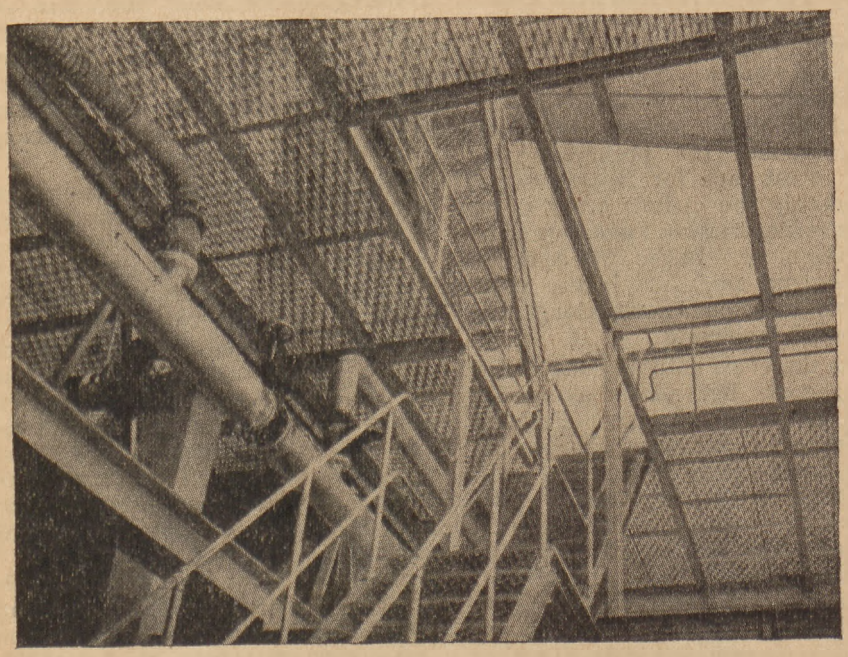

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mably greater by its being essentially a world-fleet rather than a coastwise and domestic fleet. Moreover, the Norwegians are born seafarers, and, combining their inherent capacities with technical efficiency, they have created a profession of the sea with a tradition and reputation for reliability.

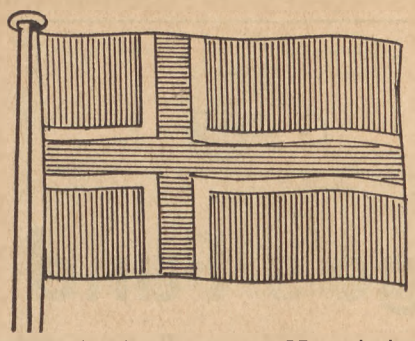
These are important factors in any valuation of Norway's shipping contribution to the war effort. And this is a sea-war to an extent unique in history, the contribution of Norwegian shipping cannot be over-estimated.

To men of the Norwegian tankers is due a goodly portion of the credit for the victory of the R.A.F. in the Battle of Britain, and it is fit that Mr. P. J. Noel Baker, Parliamentary Secretary to the Ministry of War Transport, should describe Norwegian tankers as the "Spitfires of the Atlantic." Norway is well represented in the great and vital convoys to Murmansk, Malta, the Far East. Norwegian ships have evacuated Allied troops from Dunkirk; they have also brought triumphant armies to French North Africa.

Norwegian seamen are conscious of being more than mere carriers, however. Their ships have been armed, and their guns have spelt doom to many an Axis U-boat and plane. In the South Atlantic, a little Norwegian cargo ship became a second *Jervis Bay* when she challenged a German surface raider and fought until finally destroyed by the vastly superior guns of the raider. All men went down with their ship, but the convoy, of which she formed part, was saved.

It is inevitable that Norway should be paying a heavy price for the part she is playing in the war. Some two thousand men and about 300 ships have been lost since April, 1940. It is worthy of note, however, that during the six months prior to the invasion of Norway, when Norway was still neutral, the Norwegian shipping losses were scarcely any lighter. For Nazi Germany was just as intent then on destroying Norwegian shipping as she is now, whilst now, on the other hand, Norwegian ships are armed and can hit back. It is also a consolation that human losses have been comparatively light, and according to an American investigation Norwegian ships are, owing to the latest life-saving devices, the safest ships among the United Nations.

Three hundred ships are a considerable loss, however, and present the Norwegian Government with a real shipping problem. Norway has been promised a share in Britain's construction programme, but acquisitions hitherto have in no way



balanced the losses. Negotiations are still in progress with the United States with the purpose of transferring some of America's new ships to the Norwegian flag, and in view of Norway's recent inclusion in the Lease-Lend scheme these negotiations should have a fortunate outcome.

In the meanwhile, the Norwegian Government and the Norwegian Shipping and Trade Mission (which manages the Norwegian fleet) are doing their utmost to recognise the great debt owed to the many thousands of Norwegian seamen who year after year are sailing in the war zones. Hundreds of thousands of pounds are being spent on their welfare, and holiday homes, hospitals, and reading rooms have been established in many parts of the world. It is little enough recognition of the job of work which Norway's seamen are doing; it will rest on the people of Norway after the war to bestow full honour on their gallant seafarers.

That the Norwegian war effort at sea is also realised by the Nazis is proved by the frantic efforts made through the ether to induce Norwegian seamen to sail their ships into Axis-controlled ports "and come home." Threats and bribes have been used, all in vain. Not a single Norwegian ship has succumbed; everyone has remained loyal to the United Nations and the legal Norwegian Government. The Norwegian people in occupied Norway are depending on their seamen to bring home, one day, the greatest cargo ever carried in a Norwegian ship, the cargo of liberty.

YOUNGEST OF THE UNITED NATIONS' MERCHANT FLEETS – THE POLISH

POLAND, the first ally to join her naval forces with Great Britain in the present war, is the youngest maritime state amongst the United Nations and her merchant fleet is the smallest. Nevertheless, the seamanship of the Polish merchant navy personnel, their ardent zeal both for work and battle, puts the Polish merchant navy on a level equal to those of the countries with the oldest maritime traditions. It is not surprising, then, that amongst the United Nations Poland is highly valued by the British authorities and the British Admiralty as a maritime ally. And Poles, themselves, take a special interest in the Polish navy and merchant marine.

Poland has reason to be proud of her attainments at sea and, above all, of the position which she has managed to achieve among the maritime nations of the world. Twenty years ago no one could even suppose that Poland would ever be able to play any role at sea, possessing as she did only 46 miles of sandy sea coast with not a port on it.

However, the twenty years have sufficed for Poland to join the family of maritime states. In truly American tempo she built Gdynia, which has since become the largest port on the Baltic and one of the largest in Europe.

Simultaneously, steps were taken to create a national merchant fleet, with a programme of construction to reach a 650,000 tonnage in the years to come. The outbreak of war prevented the realisation of these plans, but the results which were attained up to September 1, 1939, were particularly good. Although the general tonnage of the Polish merchant fleet cannot be regarded by the nations with longer naval traditions as imposing, nevertheless its modest value numerically has been increased by the quality of personnel. This quality has been proved especially during war conditions when the officers and men of the Polish merchant navy have added new pages to the history of sea exploits, pages of which even an old sea power would be proud.

The first and one of the most important feats of the Polish merchant navy during this war was the escape of 95 per cent. of Polish ships from the Baltic Sea, closed and well guarded by the Germans, to the safety of British ports. This was possible thanks to a timely and well-prepared plan for its dispersal.

When once in relatively safe waters, the Polish merchant navy began heavy daily routine work which ships have carried on for three years. It is to be regretted that sometimes this hard work cannot be sufficiently recognised by everyone since, owing to the necessity for secrecy, it has to remain unpublicised. These ships carry on transportation of arms, ammunition, foodstuffs, raw materials—in short all

G. R.

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that is necessary to keep up production in the British Isles. And, of course, there is also the transport of troops.

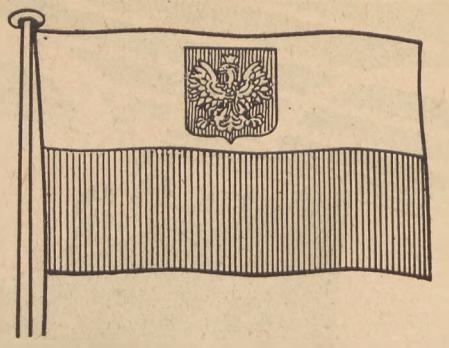
During these three years of war there were many instances which showed up the Polish sailors, in their daily routine work, at their very best. Polish ships took an active part in the battles off Norway—above all off Narvik. Later on they helped to evacuate the British and Polish troops from France.

After the fall of France the French authorities interned a large number of Allied merchant ships at Dakar, six of them Polish. The first six ships which managed to escape from Dakar, in spite of the fact that parts of their machinery and some navigational instruments were taken away, were the Polish ships. Amongst them was the *Kroman*, the heroic escape of which gained world-wide attention.

Some time later two Polish merchant ships, the *Morska Wola* and the *Puck*, participated in the famous convoy which was so heroically defended by the British auxiliary cruiser *Jervis Bay*.

Another Polish ship, the *Warszawa*, took an active part in the Greek campaign, later on off Syria, and then in the battles for Libya carrying arms, food and troops to Tobruk, then partly defended by Polish detachments. *Warszawa* paid dearly for her glorious participation in these campaigns; she was sunk by enemy action and four of her crew lost their lives.

Still another Polish vessel gained distinction during her first voyage to Northern Russia, when she destroyed



one enemy aircraft for certain with one probably destroyed. This vessel, in spite of serious damage, managed to return from Russia to a British port.

Among the front line vessels which carried out the assault on Madagascar was a Polish merchant ship. She had on board British commando troops. In the French North African campaign several Polish merchant ships are taking part side by side with Polish naval units.

It is worth mentioning also that the Poles have contributed much to the number of enemy aircraft shot down at sea. The fight against German bombers gives an especially great pleasure to Polish seamen, and whenever a German aircraft plunges into the sea, as a result of a Polish bullet, the event is accompanied by a thought —"that is for Warsaw and other ravaged Polish towns."

The activities and sacrifices of officers and men of the Polish merchant navy have already received recognition. The British Admiralty and the mercantile marine authorities frequently take the opportunity of emphasising the great value of the Polish merchant marine, which they consider to be a worthy partner of the Polish navy, on whose valiant deeds so much has already been said. It is not surprising then that the officers and men of the Polish merchant navy have received, as well as their Polish military decorations, a considerable number of British decorations.

Unfortuntely, as a result of this active participation in sea battles. Poland has had to pay sacrifices which, in view of the small tonnage of her fleet, are relatively heavy. Among the ships which have gone down was the motorship *Pilsudski*, one of Poland's finest liners. A large number of Polish officers and seamen have met their death at sea, anl rest in far-distant ocean beds.

But the remaining Polish vessels, all of modern type, among which are a number of first-class liners, continue to give full support to the common cause of the United Nations. Wherever it is necessary to go for the sake of this cause these Polish ships proceed.

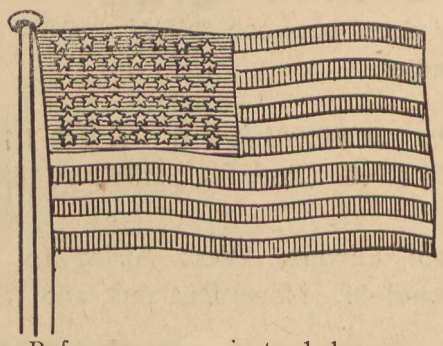
Joseph Conrad, a Pole, but the greatest creator of British sea literature, if alive to-day, would have cause to be proud of his compatriots. Before his death in 1924 Poland did not participate in life at sea. But he, a captain of the British Merchant Navy, cherished hopes that his fatherland also would obtain full rights to profit from the seas and oceans of the world.

It is certain, now, that Conrad's dreams will be fulfilled. For Poland has given abundant proof that she will be an honourable member of the fellowship of maritime nations.

"KEEP 'EM SAILING" IS THE SLOGAN OF AMERICAN SHIPPING

"KEEP 'em sailing" is a slogan which typifies the contribution which the United States of America are making to the Merchant Navy Power of the United Kingdom, and it is a slogan which has been adopted by those who man as well as those who build American ships.

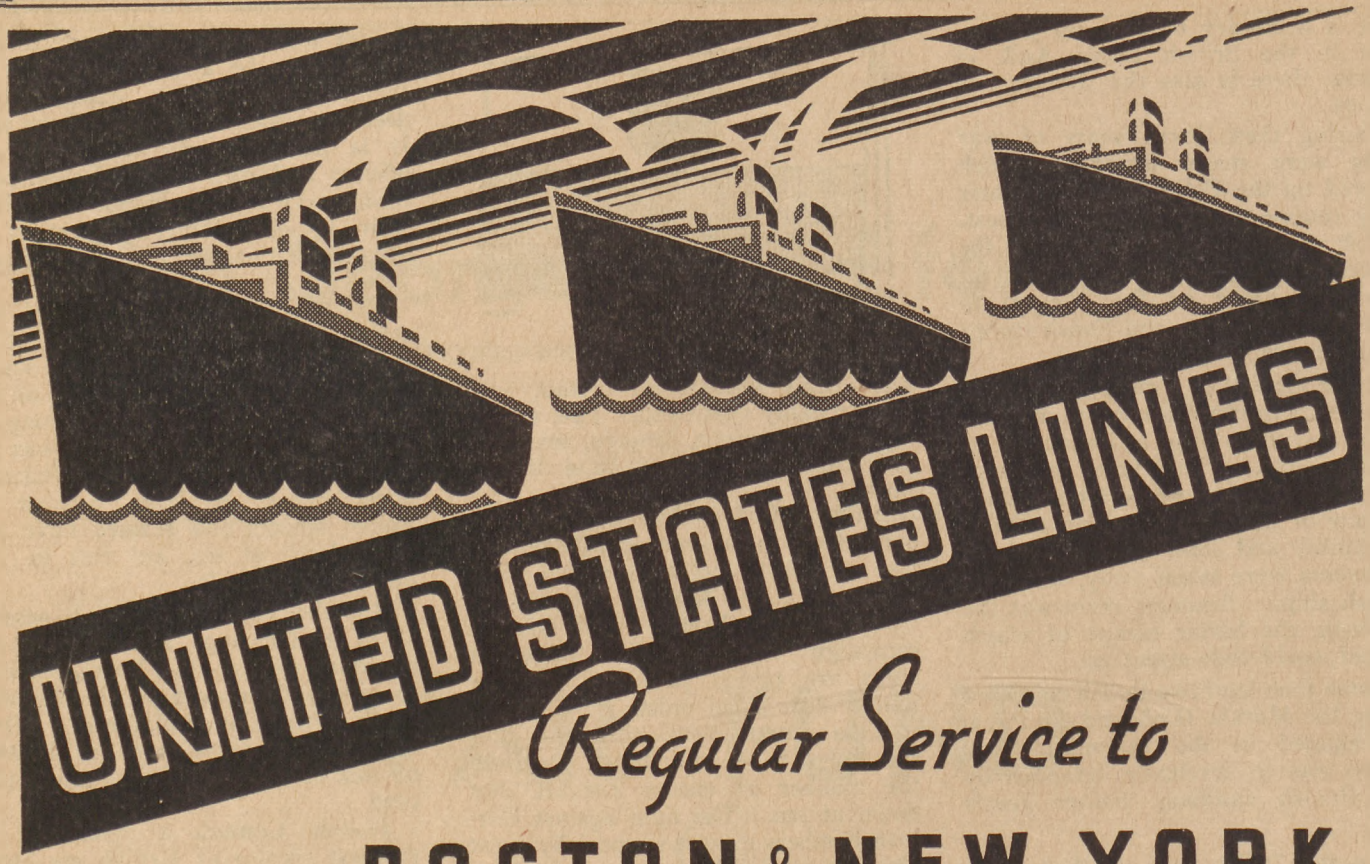
Shipbuilding in the United States is the subject of a special article elsewhere in this issue, and we regret that due, presumably, to enemy action we have not received for inclusion in this symposium an article which Captain Robert C. Lee, U.S.N.R., executive vice-president of Moore-McCormack Lines Inc., had agreed to write on the achievements and aspirations of the American merchant fleet, which shares the responsibilities that rest upon the shipping of the United Nations, just as it does the common dangers.



Reference may instead be appropriately made here to an address given at the 29th National Foreign Trade Convention by Rear-Admiral Howard L. Vickery, U.S.N., vice-chairman of the Maritime Commission and deputy administrator, War Shipping Administration. After describing the way in which American yards are providing so much of the tonnage needed by the United Nations, Admiral Vickery said:—

"At the close of 1943, in number of first class merchant ships only, the United States would be in a good competitive position if normal peace-time trade conceivably could be restored overnight. In addition, if it is necessary to continue the present rate of shipbuilding through 1944, the output of that year will consist of a still greater production of first class tonnage. We are seeing to it this time that the American Merchant Marine of the future is not handicapped by reliance upon vessels unsuited to commercial competition.

"Nor will our fleet of the years to come lack for trained and efficient seagoing personnel. To man the ships we are building, more than 100,000 men must be recruited and trained by the end of this year.



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The War Shipping Administration, to meet this demand, is operating schools for apprentice seamen, specialists and licensed officers. Opportunities also are being offered seamen to prepare themselves for officers' examinations. A heroic calling in war and a respected one in peace, seafaring now holds more for young Americans than it has ever held before.

"Speaking of our merchant seamen, too much cannot be said for the patriotism and courage they are displaying in the war at sea. The fact that they have resisted the allure of safety ashore, that they are sailing again and again, risking, and often meeting, miserable and unglamorous death, will reflect to their eternal honour. Certainly they are showing that ships flying the Stars and Stripes need never be out-manned in post-war commerce.

"When the war will end is a matter for conjecture. But there is one thing you can be sure of: The men in the shipyards and the men who go to sea are doing their part to hasten the day of final victory. In so far as their accomplishments are concerned, the battle goes well for us.

"You also may be sure that our Merchant Marine will be in a position of world predominance when the last gun is fired. In the number of ships, and in their quality, there will be the means to implement our foreign trade policy, whatever it may be.

"Foreign traders will help to formulate that policy. Let its cornerstone be increased patronage of American flag vessels. Let it be one which will keep our shipping and shipbuilding industries alive to-morrow. They are doing their part to keep America alive to-day."

To "Keep 'em sailing" until the defeat of the Axis has been accomplished is the declared aim of the National Maritime Union which, after the Japanese attack on Pearl Harbour, sent a telegram to Admiral Emory S. Land, War Shipping Administrator, urging him to call an immediate conference of Government representatives, the shipping interests, and the maritime unions to work out an effective programme of stabilisation of the industry, movement of vessels, servicing, training, and general conditions in the Merchant Marine.

One week later that conference was held. The representative of the National Maritime Union made the organisation's position clear: "Our union pledges its man-power, its financial resources and every possible thing we can do to ensure and fulfil the nation's full effort. We feel that difficulties we have had in the past should be absolutely submerged, because not only one section of our industry has been attacked but the entire nation, and in order to carry out the Administration's war effort it calls for united action in all parts and from all parties."

Welfare of American seamen ashore in foreign as well as home ports is now the concern and responsibility of the United Seamen's Service, which is a civilian organisation authorised by the Government to represent the public interest, the shipping companies and shipbuilders, and the maritime unions. It will not only meet emergency welfare needs of merchant seamen both in America and abroad, but will also provide for their normal peace-time requirements. Admiral Emory S. Land, Administrator of the War Shipping Administration, is chairman of the board, and Mr. Henry J. Kaiser, West Coast shipbuilder, is president.

Rest homes, clubhouses, recreation camps and hotels for the use of seamen between voyages and when convalescent are the types of facilities the United Seamen's Service is providing. In addition, medical and welfare services for the special needs of seamen are being set up.

[By courtesy of "Picture Post."

In the chart room, the positions of all British and Allied merchant ships are recorded. **(See article on Page 109).**

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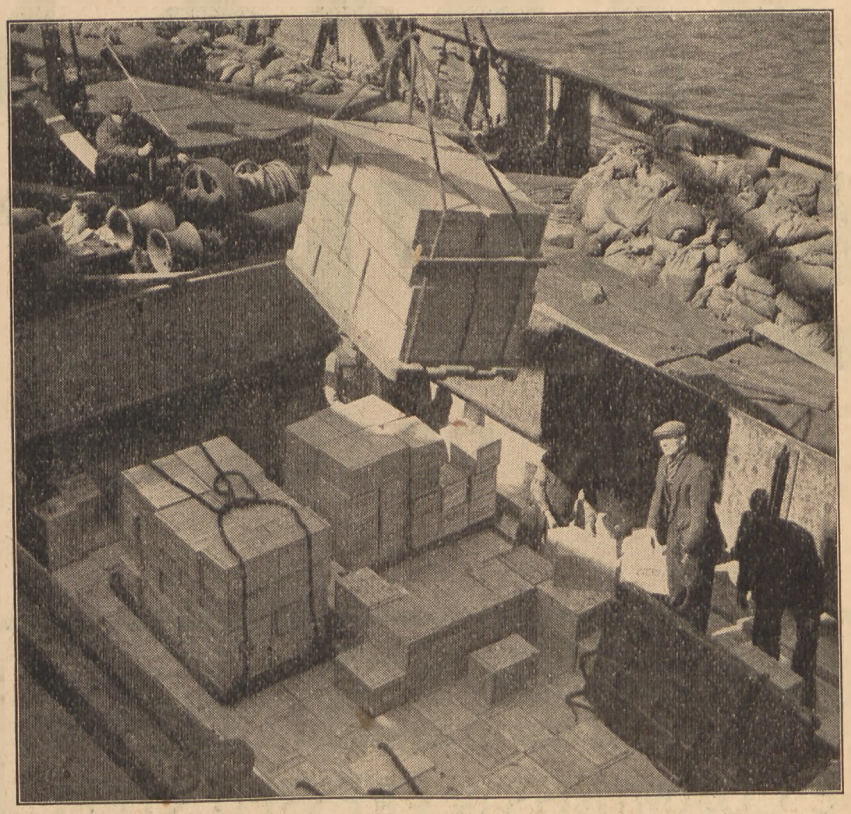
A Commentary on . . .

Merseyside Dock Labour Problems During a Year of Great Interest



DURING the first quarter of 1942 the Dock Labour Scheme on Merseyside completed its first year of operation. The introduction of the scheme had a profound significance not at first fully appreciated. As the Dockers' Charter it gave them security of employment and a guaranteed minimum of £4 2s 6d weekly while they were available for work. Thus the problem of decasualisation which had defied solution for so long was settled by Government decision. Although under the terms of the White Paper the scheme is to terminate at a convenient date after the conclusion of hostilities, it seems hardly likely, especially in view of the trend towards greater social security, that there will be a return to the highly casual employment of pre-war days. Indeed, in the schemes put into force at other ports under the National Dock Labour Corporation, Ltd., no termination date is included in the text of the orders.

The purpose of the scheme was to ensure an adequate supply of labour so as to secure a quicker turn-round of the ships in port in view of the heavy traffic passing through the North Western area. Each docker was obliged to accept the terms and conditions of employment which, broadly speaking, required him to work, if necessary, a minimum of 11 turns of four hours on specified work as directed by a port labour inspector. He was also required to remain at his job as a registered docker, though he could terminate his employment on a week's notice. By reason of the activity of the port, full employment and high earnings were available for most of the regular dockers, hence when the scheme came into being they were less appreciative of its advantages, and for many its implication as to their future welfare was entirely lost.

For the employer the scheme meant a radical change in his methods of engaging men, and in his relationships with them. The Minister of Transport became the employer of labour, and shipowners, master stevedores and master porters registered with the Regional Port Director as "approved employers," but ceased to have any direct interest in the matter. Ship side stands were discontinued and "approved employers" were required to requisition their men from various control points set up along the line of docks. In effect they hired the men from the Minister and were thus only their employers in a secondary degree.

In due course this had an important effect on the employers' relations with the men which was reflected in output figures. The men came to regard themselves as being only indirectly under the control of the employer, whose foremen and chargehands, while continuing to exercise their supervision, lacked any punitive authority. As the scheme was intended to be self-supporting, a flat percentage was added to the wages earned by any labour supply to an approved employer to cover the cost of administration and the amounts due to each man under the guarantee.

Mr. Gibson Jarvie, the Regional Port Director, was responsible for the administration of the scheme, under whom the labour superintendent, with his port labour inspectors, arranged the allocation and utilisation of the available labour forces. While in theory the allocation of men in accordance with the requisitions sent in by employers should have proceeded smoothly, in practice it was found to be the most difficult task of all. The limited time between the attendance of men at the control point and their being set to work at the appointed time by the employer required quick and efficient work at the controls and the absence of any hitch.

At times the labour inspectors were confronted with shortages at their control which required transfer from other controls, and delays occurred. That they could not wholly succeed

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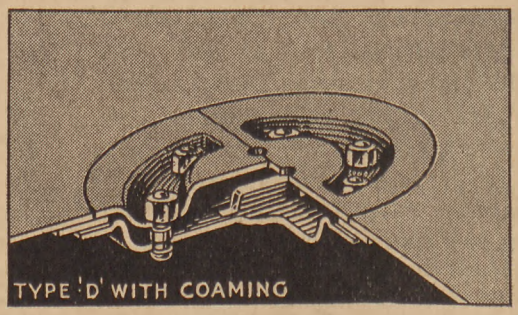

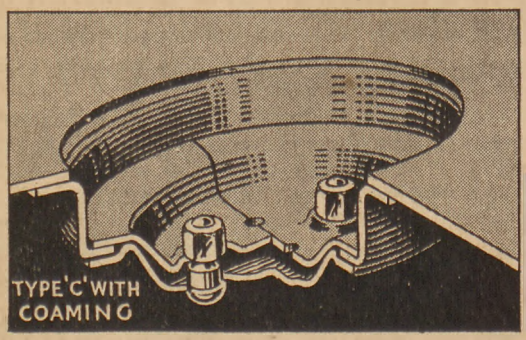

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in putting men to work as quickly as individual employers were able to do reflected no discredit on them, but rather pointed to one of the major defects of the scheme, the absence of direct control by the employer. Reduced to its simplest form the task of the labour superintendent resolved itself into the regimenting of 16,000 men into a mobile labour force.

In this, the habits and attitude of the docker became an important feature. Unless he was a regular worker favoured by a firm—known among the dockers as a "blue eye"—the docker under normal conditions was not able to secure a full week's wage and had to supplement his earnings by unemployment benefit. Before the war it was recognised by them as a regular practice, to which they were resigned. It was succinctly expressed by them in the phrase, "three days on the hook and three on the book."

Some had been so long working in this way that continued regular employment, which was their lot after the outbreak of war, was irksome, and for many a real hardship. While their loyalty was not in question, their stamina was not proving equal to the strain of regular day and overtime work, including Sundays. The result was a high percentage of absenteeism, which continued when the scheme came into being and was responsible for a certain amount of delay in putting men to work, as men failing to return to their job made it necessary for the employer to make last-minute applications for substitutes to make up his gangs.

Moreover, when the men were at work opportunities for a break were always looked for. The frequency with which the men were able to get away for a spell depended upon the degree of supervision exercised, and foremen found that control without authority made their task doubly harder. The result was that control frequently was inadequate, and some were quick to take advantage of this. Hence "spelling," which was recognised only in the case of men working in refrigerated spaces in a ship, spread to other classes of work with consequent slowing down of output.

Thus the administration found that in taking over the labour force they had set themselves some difficult problems to solve. Their men were composed of many types, some good, some bad, and in general representing a cross-section of the working class. But most of them had been through the mill; many were still conscious of the hard, lean times of the past, and they were in the beginning a little suspicious of the more favourable treatment being meted out to them.

It is against this background that the criticism lodged against the men and the scheme later in the year must be viewed. "The Times," in publishing in August the views of a supervisor of his twelve months' experience working among the dockers, although revealing nothing that was not known to those familiar with dock work, did a public service in bringing the whole problem to light.

In his charges against the dockers the supervisor alleged that they were dodging work, that "spelling" was widespread, and that there was laxity in control in that foremen had lost the power to refuse and dismiss labour. Moreover, generous piece-rates enabled the men considerably to increase their earnings without a corresponding increase in output. Criticism was also levelled against the facilities provided by the Mersey Docks and Harbour Board, cranes had often little or no pressure, and railway lines ran to dead ends without any circuits, hence there were bottlenecks everywhere on the dock area.

The running of the scheme was also brought under fire, as it was asserted that control point officials, being well paid, desired the scheme to continue and therefore kept any trouble quiet. Work, too, was badly distributed among stevedoring firms, who, under the "cost-plus" system, were being paid between 30 and 40 per cent., and knowledge of this had its effect on the attitude of the workers.

Although Mr. Gibson Jarvie made a spirited reply to those charges, which he said were mischievous and contained only a small element of fact, the allegations were supported by three other supervisors, thus producing a direct conflict of statement of fact, and "The Times," in view of this, asserted that the best way to dispose of these allegations was by a competent and independent investigation carried out with expedition. As a result of this and other publicity Sir John Forster was appointed by the Minister of Labour and National Service and the Minister of War Transport to review on their behalf the conditions obtaining under the Merseyside Dock Labour Scheme.

A direct consequence of the decision to hold the inquiry was the resignation of Mr. Jarvie, who took it as a mark of no confidence in his work as Regional Port Director. It was subsequently stated in the House of Commons that the inquiry involved no reflection on Mr. Jarvie, who there-

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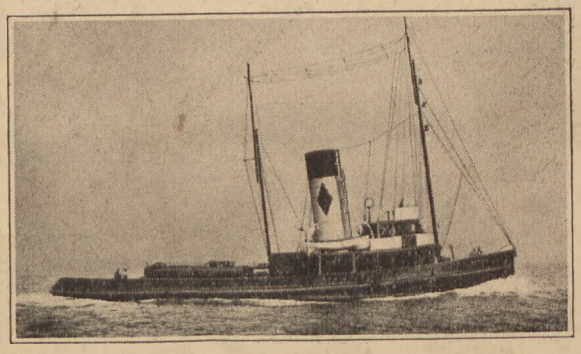

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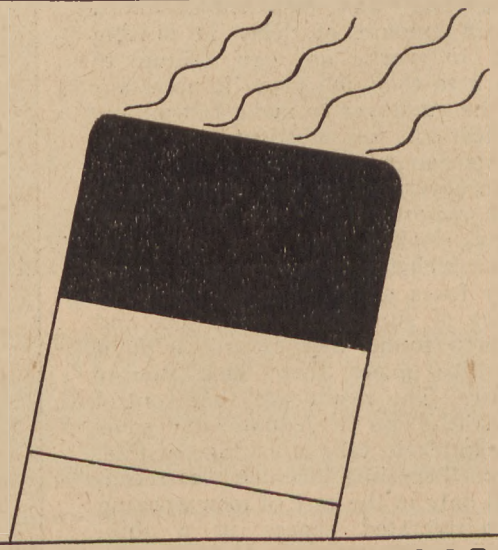

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upon offered to remain, but the Minister of War Transport, while appreciating the gesture, replied that a successor had been appointed. In due course Mr. Robert Letch, previously Regional Port Director for Scotland, took up the work so rigorously put in hand by Mr. Jarvie. The departure of Mr. Jarvie was received with real regret by many, and especially by the dockers, who, in fact, petitioned the Minister that he be allowed to remain.

This view was quite understandable, for Mr. Jarvie, by his methods of direct approach, had made himself well known to the men. Moreover, he believed they were anxious to do their best, willing to carry their responsibility, and a number had responded to his gestures of trust in them.

The inquiry was held in private, and apparently its findings will not be made public. But the investigation will have served its purpose if ventilation of the problems brings about improvements in operation and administration which could be obtained within the framework of the present scheme. On the question of supervision and discipline there is a diversion of views between employers and the authorities. The employer and his foremen have been criticised for not exercising keener supervision and control, but, in fact, the defect lies deeper, and is contained in the White Paper.

The Minister of Transport, in becoming the employer of the men, left the employer with only a shadow of his former authority. Men could no longer be dismissed for breaches of discipline, they could only be returned to the control, and in many cases the employer was not informed of the action, if any, taken against them. With minor breaches of discipline, foremen quickly found that warnings or appeals had little effect.

Moreover, not all foremen were permanent employes, a number were only temporarily in charge, and frequently, on their return to the control, were allocated to work alongside men they previously had been "bossing." It was only natural that these temporary chargehands, for their own wellbeing, and to keep on good relations with the men, turned a blind eye to "spelling" or working on the "welt."

Employers point out that provision is made in the White Paper for such modification as experience or administrative experience may show to be desirable, and they have asked that they should now be allowed to keep attached to them some of their regular men.

In peace-time most employers had regular gangs of men working for them; these men generally got whatever work was available, and some did not work for any other firm. When the scheme came into effect employers found a number of their men dispersed and their requirements were made up with strangers.

This was an important factor in reducing output, for although it was laid down that in allocating men to the different employers the port labour staff would use all possible endeavour to supply men accustomed to their methods, their ships and cargoes, the mere fact that the men were not the employer's regular hands meant that they had no particular loyalty towards him, nor a pressing anxiety to maintain his standard of output.

Given a nucleus of his former men the employer believes that the situation could be materially improved and that the advantages would be cumulative, for not only is it possible to control regular men and exercise

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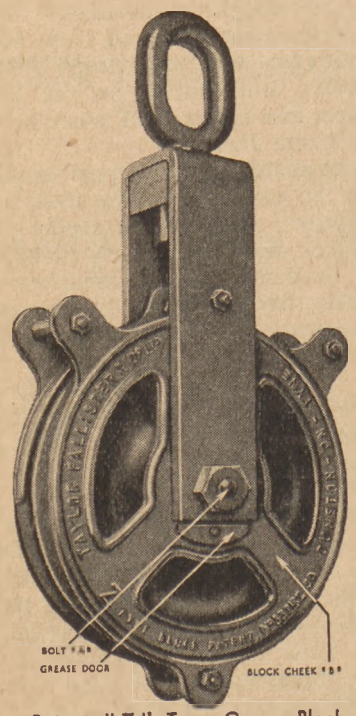

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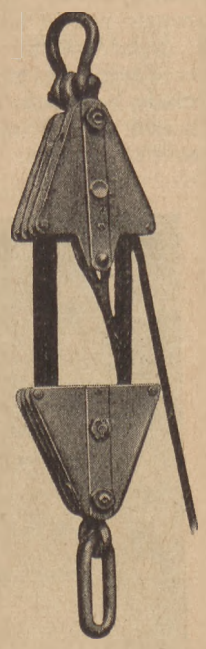
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better discipline but the factors which have caused criticism would be considerably minimised.

"Spelling" could be brought under control. There is no doubt that it does go on although part of it is innocuous, for most firms consider it reasonable to allow the men in the hold to come up on deck for a breath of fresh air in the mornings and afternoons. It is the abuse of this practice which causes the trouble, for fewer men in the hold increases the time between the slings being filled and allows the rest of the gang to take it easy. With regulars any man not pulling his weight would soon be found out by the foreman, and if he did not mend his ways could be removed from the gang.

It is unlikely that the Minister at this juncture would agree to relinquish his direct interest in such men, but the employer, for the time being at any rate, would be content to have the men permanently attached to him. In this connection it is interesting to note the different practice at other ports where the schemes are operated by the National Dock Labour Corporation. At these ports the Minister of War Transport does not employ the men, but they remain under their own employer until he has no work for them and then they enter the employment of the corporation and remain in the pool until they are required. By this means continued employment and a guaranteed wage are available for the men over whom the employer has direct control so long as he has work for them.

In addition the question of absenteeism could be clarified, as with a proportion of men regularly employed it ought to be possible for the administration to institute a check on those who remain. It is well known that the rate of absenteeism is high and that Mr. Ernest Bevin, at a meeting last February, expressed his concern about the 30 per cent. of the dockers in the Merseyside district who were breaking their guarantee.

How much of this absenteeism is deliberate is not known, but there is a legitimate explanation for part of it. The average age of the docker is said to be 46; most of them under 30 have been called up, and the average age indicates a fair proportion of the men must be in the higher age groups. It is easy to understand that men in their fifties cannot stand the strain of a seven-day week, and for them rest pauses are necessary.

For others, enemy action has made it necessary to live further out and the extra time taken on the journeys makes their working day very long. To compensate for this they take occasional days off. Sickness is also a contributory factor, but as there are no separate medical facilities for dockers nor any scheme of organised medical supervision, it is difficult to say whether the incidence of sickness is higher than in other industries.

The policy of working on Sundays also has an effect, for men are anxious to work on Sundays and a number then take a day off in the week. It pays them to do so, since they receive 36s for Sunday and lose only 15s on the day they do not turn up. Nevertheless, after taking all these factors into account, there is still left a hard core of deliberate absenteeism to be dealt with; if it were corrected it would make it less necessary to have men transferred from other ports.

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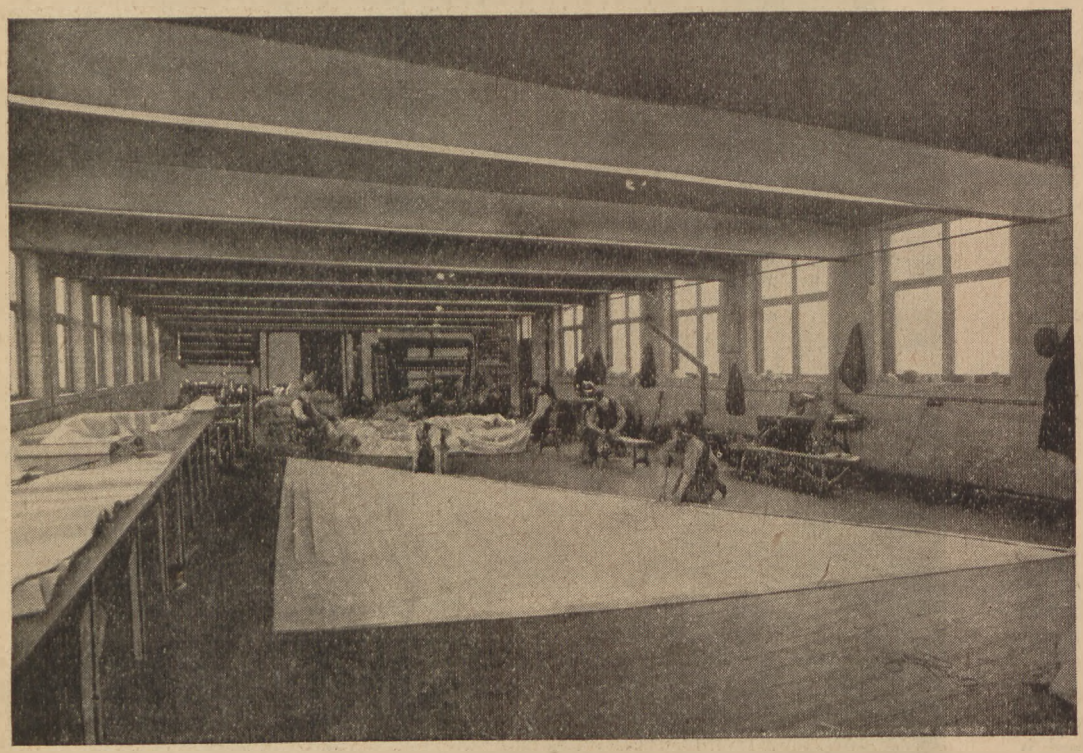

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time could be dealt with more easily if employers had their own men. In the first place, men would report to their job, they would know their gang, and they would have no excuse for not making a prompt start.

At the present time, when men are requisitioned at the control, they are collected together, then ordered to the ship at which they are to work. When they get on the job they have to be classified into gangs, holdsmen, winch drivers, quay porters and the like, and precious time is lost doing this. As regards men leaving before their time, it must be admitted that inadequate facilities for the docker have been a big factor. Men must eat—and the docker has to find some place convenient to his work where he can obtain a meal. Before the war catering arrangements on the dock estate were left to private enterprise. When the war began not only were more people working on the docks, but as time went on those who were content with sandwiches found it difficult to obtain suitable filling, and to ease the rations at home they, too, sought a mid-day meal.

The canteens were entirely inadequate at meal-times for the people who required them, and the Dock Board had to undertake the task of providing additional canteens, but it was some time before they became available, and even now more accommodation is required. It is therefore no uncommon sight to see a queue of men outside a canteen 15 to 30 minutes before mid-day. In fairness to the registered docker, it must be stated that not all the men forming the queues are dockers, for there are shiprepairing tradesmen, scalers, carters and others who help to make up the number.

The men have suggested that some system of reservation be adopted, but the difficulties in the way of doing this have prevented any action being taken. The only solution is to step up the canteen accommodation to cover the number of workers available: when that is done there will be less urgent need to go to a canteen early in order to get a seat and a meal.

A similar position obtains at the end of the day with transport. Most of the men travel by tram or overhead train, and whether they finish at five or seven there always seems to be a crowd waiting, and to ensure a seat the men try to steal a march on their colleagues. In the aggregate, the time lost on late starts and early finishing must be quite considerable. The men must share part of the blame, but attention to the causes set out above would help to reduce the time lost.

A new feature in cargo working is the extension of piece-work. Liverpool was never a piece-rate port, and the majority of the dockers worked at time rates. When the dock scheme came into force it was the intention that the employment of the men on a guaranteed weekly basis should be combined where possible with payment by results.

The first schedule of rates for discharging introduced under the scheme contained few items, and the results achieved were negligible. A second schedule came into effect at the beginning of 1942, which was more comprehensive. The general datum level was stated to be 10 per cent. below average pre-war output, and the Piece Work Committee were advised by the Regional Port Director to arrange the rates so that the men could earn £1 a day.

In practice, it has been found that with some commodities high rates could be earned without undue exertion. Cargoes such as steel billets and cased goods of food were easy to discharge and the men earned good money working these commodities. What actually happens is that the men exert themselves on goods which they know yield a high return, and take it easy when working other goods.

As their wages are guaranteed at a minimum of 15s, they do not stand to lose in any way; if the rate of working on piece-work does not yield 15s their money is made up to that amount.

The proportion of work done on a piece-work basis is not very high, but the age composition of the men should be borne in mind, as the older men are content to work at time rates. There is no piece-work tradition in the port as is in say, London, where a good deal of the work is done on piece-work, and in peace-time the incentive gave the men good earnings for a high output. This incentive throws an interesting sidelight on the question of "spelling," which is not recognised in London, even for refrigerated cargoes. In Liverpool, it is still the practice for

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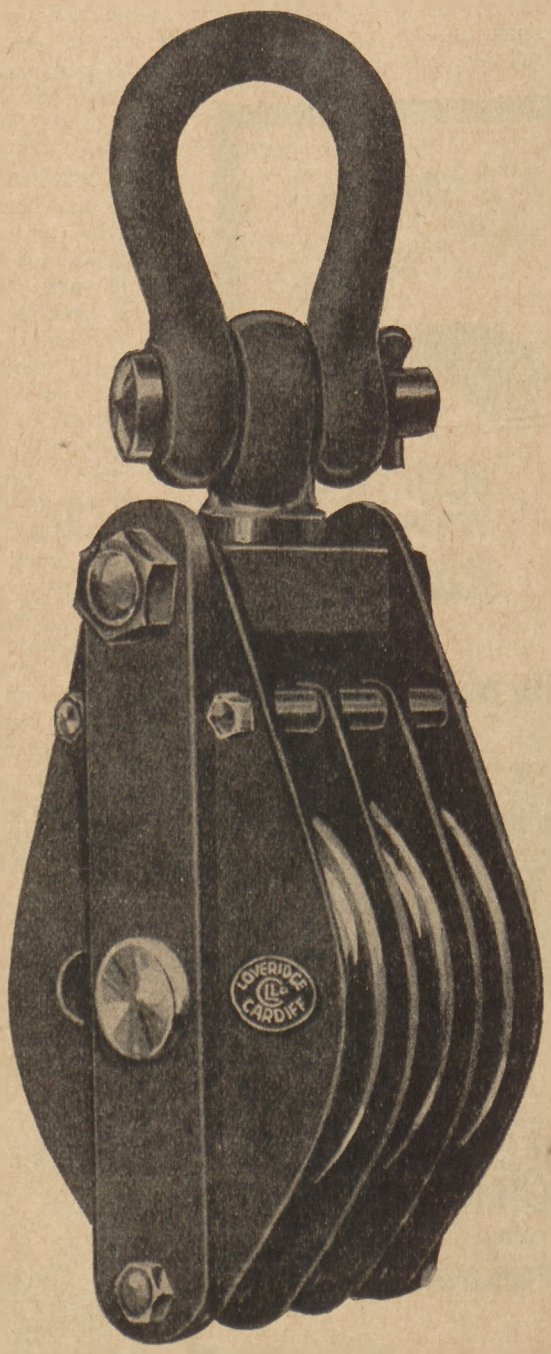

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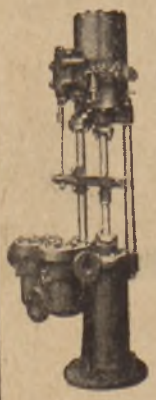

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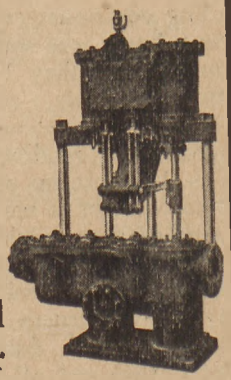

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half the men working in a refrigerated hold to be relieved every hour; the work, which was formerly done on time rates, is now on a piece-rate basis, but the recognised "spelling" continues.

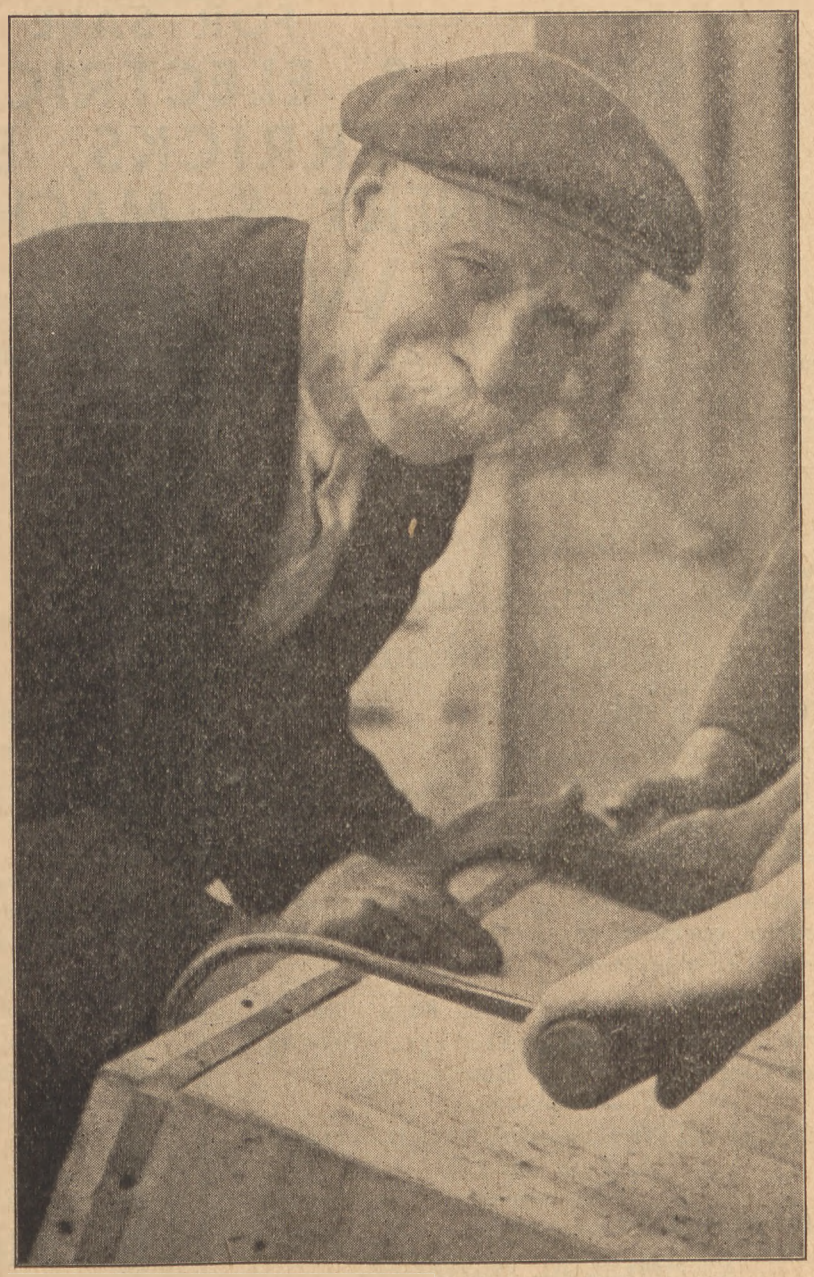
Piece-work rates for loading have been in operation since July last. They are calculated on a co-operative payment, that is to say, individual gangs are not paid on the basis of their own work done, but the total piece-work earnings of all the men are pooled and divided amongst them after the ship is completed and the total cargo loaded has been determined.

The rates were frankly an experiment, and were subject to review in the light of experience. It has been generally admitted that they were too generous, and, being based on measurement tons, allowed men to earn high rates without increasing the rate of loading. The schedule was revised later in the year and based on deadweight tonnage loaded, which should meet the criticism levelled against the rates first introduced.

One anomalous feature of the scheme which called for revision was that stevedores, while still operating on a competitive basis, could take on work at any part of the dock estate. Frequently firms were working ships on berths widely separated, and this was not conducive to efficiency. Gear had to be moved from berth to berth, though a certain amount of borrowed gear was generally used, but working in this way added to the stevedore's difficulty of supervision since his staff had to be scattered, and they were obliged to take men from the control in the area where the ship was working. Moreover, if two ships following one another on the same berth were discharged by different stevedores, it meant that both firms had master porterage work on cargo left on the quay.

It was obvious that some system of rationalisation would have to be applied, and in March a zoning scheme was proposed to restrict master porters and stevedores to specified areas. Unfortunately the interests against the scheme were too strong and the idea was dropped.

With the arrival of the new Regional Port Director a new scheme was proposed which was much more drastic in its treatment of employers. Not only were employers zoned to work only in certain areas, but also they were limited in the number of vessels they could work concurrently. This last feature apparently proved too experimental to be put into effect immediately, and it has been deferred until experience of the working of the zoning scheme has been obtained. There is no doubt that the zoning scheme will increase efficiency in working ships, though it may mean some firms giving up work they have been accustomed to do for a long time.



Linked with the zoning scheme is a further proposal which will go far to meet the views put forward by employers regarding the allocation of men. The Regional Port Director, in his draft scheme, proposes that dockers are to be organised into regular gangs, under permanent foremen, these gangs to be allocated to the approved employer for whom they have been accustomed to work. Employers will be given freedom of choice in selecting men, and, in turn, each man will be given the opportunity to attach himself to an approved employer, subject to the approval of a port labour inspector.

It is intended that when men have to be transferred from an employer who has no work for them, they will move as a gang together with their foreman. To help employers in selecting their men at controls, employers' stands are to be set up; these are the next best substitute for the employers old "shipside stand," and should meet many of the objections raised against the present method of hiring. As men with their foremen will be brought back to their home control as quickly as can be arranged, employers will be able to draw on their own regular hands, and much greater efficiency ought to follow this move.

In this connection, Mr. Letch has shown that he has given a good deal

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of consideration to criticisms that have been levelled against the scheme and that he is prepared to make whatever adjustments are possible to meet them. Thus on the question of supervision and discipline he has caused instructions to be issued which still place on employers the onus of superintending operations continuously and of seeing that discipline is maintained. Taken by themselves, the instructions would be of little use, but coupled with the attachment of men to the employer, it should ensure a rigorous tightening up of any slackness.

For the first time, too, a complaint report is to be used in which employers will be expected to specify the reasons for making the complaint. An important addition is that provision is now made for employers to be advised of any action taken against the man reported upon, and if the procedure set up is used effectively by the employer and the labour superintendent's staff it should reduce the number of complaints and expedite the work.

One feature of the Liverpool scheme which up to now has not obtained at other ports is that coal trimming is also provided for. In total, the number of coal workers is not large and does not exceed several hundred men. These followed regular employers who had their own stands at a point on the dock road in the centre of the city. In theory, it ought to have been easier to control this small number than the cargo workers, but in practice it has worked much less smoothly.

There is no interchange between cargo workers and coal trimmers, since few dockers are induced to take up the work, which needs hard and vigorous effort, despite the fact that coalworkers earn more money. Coaling is entirely unlike cargo work, since it is in the main conditioned by the coal appliances available; in Liverpool the coal tips are out of date and have not met the needs of the port for a long time. Owing to the increased number of ships requiring bunkers the tips are working by day and night, and employers have been hard put to find the necessary men. Not only are they short in number but, sheltering under the scheme, they are not working as they should.

Previously it was the practice for coal stevedores to engage their men in the centre of the dock system at 7 45 a.m., and then send them north to Canada or Bramley-Moore coal tips or south to Herculaneum tips. The men were taken on in a matter of moments, left immediately for the job, and were generally at work at

eight o'clock. Now it takes the administration longer to allocate the men to the various employers and almost invariably it is after eight o'clock when the men get on the job. Valuable time is thus wasted.

What is required is that coal stevedores should be allowed to retain their regular men in the same way as the other employers. In addition, they should be given the opportunity of recruiting new younger men and training them for coal work. It then might be possible to improve the rate of working, which seems to have fallen far below peace-time standards.

There is also a pressing need for renovation of the dock authority's coaling appliances, and while this will probably have to wait until the end of hostilities, it should be the Dock Board's responsibility to see that the existing appliances are kept working as efficiently as possible, and that care is taken to prevent breakdowns. The criticism of lack of pressure on cranes seems to be justified, and it applies to the coaling appliances as well as to cargo cranes.

In reviewing the progress of the scheme from its inception to the present time one can say that there have been considerable teething troubles which lasted longer than they should have done. There is much that is good in the scheme, and it would be folly to condemn it out of hand. The trouble has been that the administration of it has been too inflexible and proposals for its modification have been disregarded until the light of publicity has been brought to bear upon them.

It is easy for each party to the scheme to lay blame on the other side, but faults have occurred on all sides. It is probably true that the employers did not like the scheme when it was imposed upon them, but after its inception there seems to have been a genuine desire on their part to make it work.

On the other hand, the men, with a few malcontents to stir up trouble or seize opportunities to take it easy, have allowed the cumbrous machinery set up to give them an easier time. When working regularly for one employer, they show a certain loyalty to him and, though there will always be a few laggards, the remainder give a fair day's work.

During the period of the operation of the scheme the union appears to have followed rather than led its men. Their delegates lack effectiveness in controlling them, and in measures to improve output they have not taken a strong line. Their approach to suggestions to use man-power more efficiently by reducing the number of

(*Continued on page* 151)

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"MORE than one million gifts have been sent to sea since the war began": that was the message that came from the Merchant Navy Comforts Service Headquarters at Canfield in August last.

Twenty-five thousand emergency rescue kits have now been put on active service. The normal complement of emergency rescue kits placed by authority of the Admiralty in each of H.M. destroyers is 25—a number which, in certain cases, is now increased to 50.

Three thousand five hundred "next-of-kin" prisoner of war parcels have been despatched, through the British Red Cross, to Merchant Navy prisoners of war.

There in three paragraphs is an outline of what the Merchant Navy Comforts Service is doing, not only for the officers and men who sail under the Red Ensign, but for the officers and men of the Allied Merchant Fleets as well. The story of this work in 1942 is as exhilarating as a newsreel, and as varied: it has been a crowded year.

Their Majesties the King and Queen, attended by Lord Leathers, Minister of War Transport, spent some considerable time at the Merchant Navy Comforts Service Stand, which was included by courtesy of the Ministry of War Transport in the "Safety of Life at Sea" Exhibition at Charing Cross. Their Majesties examined, and personally handled, the several articles of emergency rescue kit, and signed the visitors' book before leaving.

This exhibition then went on tour and visited 24 cities and towns throughout Great Britain.

The Merchant Navy Comforts Service has also designed and sent on tour its own "portable" exhibition which, by courtesy of the chairman and members, commenced its tour at the Baltic Exchange, when Lord Leathers, Minister of War Transport, performed the opening ceremony before a representative gathering of members of the shipping industry.

Mr. E. H. Watts, Chairman of the Merchant Navy Comforts Service

Through the personal interest of Mr. D. F. Henderson, London director of Boots Pure Drug Co., Ltd., and his fellow directors, the exhibition was transferred to the Boots' premises in Piccadilly, where it is estimated that more than one million visitors have passed through the doors.

Several firms in or associated with the shipping industry, including the directors of the General Steam Navigation Co., Ltd., and Messrs. Henry Hughes and Son, Ltd., have made loans of models of articles of maritime interest for display: the ship's bell and nameplate of H.M.S. *Daffodil* are examples of these interesting additions.

Another happy feature has been the gift or loan of ships' models—ranging from the conventional "ship in bottle" 6ins. long to a huge 6ft. working model of a liner, these being placed at the disposal of the Comforts Service by merchant officers and

Lord and Lady Leathers examine some of the comforts

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these three and many other dangers our Merchant Navy and Fishing Fleets have to contend with so that England shall not starve and succumb to ruthless enemies. Death often comes swiftly, or privation in open boats for days and even weeks. The SHIPWRECKED MARINERS' SOCIETY promptly relieves widows and other dependents of those lost at sea. Many thousands of survivors from British, Allied, and Neutral ships, sunk or damaged by enemy action, have been fed, clothed and housed, without delay, at the Society's expense. Please send a contribution for this NATIONAL WORK to the Hon. Agent :—

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seamen as a spontaneous gesture of appreciation, as they put it, "for what is being done for us."

The exhibition has since visited Camberley, Stoke Newington, Croydon, Blackpool and Cannock Chase: stands have been arranged in Lyons Strand Corner House, Selfridge's and Piccadilly Tube Station by the courtesy of the firms concerned. At Blackpool, Mr. George Gibson, the deputy chairman, and Sir Walter Citrine, general secretary, together with members of the council of the Trades Union Congress, paid an official visit.

Royal interest in the work of the Merchant Navy Comforts Service was shown on many occasions during the year. Their Majesties the King and Queen visited the small stand at the "Safety of Life at Sea" Exhibition, as already mentioned, and also graciously bestowed their patronage on the Albert Hall Concert "in honour of the officers and men of the British and Allied Merchant Navies."

During the summer, her Majesty the Queen sent several sacks of knitted comforts, including several pairs of useful knitted stockings, which were the work of the Buckingham Palace and Windsor Castle work parties.

H.R.H. the Princess Royal, attended by the Dowager Lady Lloyd, president of the Comforts Service, honoured the prisoners of war packing centre and, at a later date, the headquarters at Canfield Moat, Essex, with a personal visit. H.R.H. the Duchess of Gloucester sent a number of knitted garments and recently most graciously consented to declare open the Christmas Fair in London in December in aid of the work.

For the Royal Albert Hall concert in September in honour of the officers and men of the British and Allied Merchant Navies, Lord Essendon was chairman and Lord Rotherwick treasurer of the concert committee. King Haakon of Norway, King George of Greece and King Peter of Jugoslavia were also patrons, and not only took boxes but honoured the occasion with their presence. The hall was gay with the house flags and emblems of the shipping industry.

The programme was provided by the London Symphony Orchestra conducted by Sir Adrian Boult, with the B.B.C. male voice choir and a piano recital by Miss Lilian Clark.

At 55, Pall Mall the prisoners of war packing centre does a useful, if little advertised, job of work. A Merchant Navy prisoner of war or internee is entitled to receive a 10 lb. parcel from his "next-of-kin" each quarter, which is sent to him often via the prisoners of war packing centre through the British Red Cross.

In some cases the "next-of-kin" is unable to provide a full parcel and sometimes there is difficulty in tracing a prisoner's "next-of-kin." The prisoners of war packing centre provides, each quarter, a list of articles from which relatives may select goods to be included in their "next-of-kin" parcels; 1,700 of these lists were addressed to relatives of prisoners of war in one quarter. Where relatives provide a proportion of the parcel, the remaining weight is made up by the centre from goods selected by the relatives; in the event of no "next-of-kin" being found, the Merchant Navy Comforts Service acts in this capacity for the purpose of sending prisoner of war parcels.

An associated organisation, the Sea War Library Service, 3, Endsleigh Street, London, W.C.1, might well have a new telegraphic address. It should be "OLIVER TWIST" for they are always asking for more. A glance at their figures will tell why.

To meet normal demands and emergency supplies, 50,000 books a month are needed by the Sea War Library Service. In some months this year only 15,000 books and magazines have been available. I was looking through some of their deliveries recently and the books I examined were like the curate's egg, good in parts. There were school prizes dated 1884: on the other hand a friend of the Service visited a well-known bookshop and paid £25 for a batch of modern "readable matter."

"More-readable-BOOKS."—That is the slogan of the Sea War Library Service. A national appeal for books is from time to time made "for the Services." From this number, most of which are handed over the Post Office counter, one in 12 is sent to the Merchant Navy.

Since there are neither pubs nor

DOCK LABOUR PROBLEMS—

Continued from page 147

men in a gang and increasing the size of slings has been very lukewarm, notwithstanding the fact that Mr. Bevin has said that all rules and regulations must be swept aside for the duration of the war. It was very regrettable that they should have failed to meet their obligations in providing representatives for the speed and output committees which were to be set up during the year, for by that omission a very commendable suggestion had to be dropped.

For the labour superintendent's staff it can be said that too often their good relations with employers are marred by the undue importance attached to technical breaches of the agreement. Frequently, in order to meet an emergency, employers have to switch men around or do some act not strictly in accord with the scheme, especially at night, when no night administration is available. A little more liberal attitude to such technical breaches would not only save time in completing reports, but also remove some of the irritation felt by employers when called upon to justify their action.

Given goodwill and co-operation of all parties, together with a readiness to adjust the scheme in the light of experience, there is no reason why it should not operate more successfully, and in improving conditions of working secure an increase in output at a time when it is most needed.

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clubs nor picture houses on board a merchant ship, I for one feel that the Merchant Navy deserves more books, and better books, and, yes, I am going to say it, most books. An illustrated label is provided for donors who wish to write their name and address inside books donated by them. A sack and label will be sent on request: a sack holds 100 books, unless you can persuade your wife to pack them, when somehow the capacity stretches to 150!

At the time of writing a new service has been commenced. "Hospital Service" is the name of the new scheme, by which visits are now being arranged to Merchant Navy officers and men in hospital.

Under the presidency of Lady Essendon, and with Mr. G. C. Beech as secretary, a start is being made with hospitals in Central London. Matrons are supplied with addressed post-cards on which may be indicated the rank and name of any Merchant Navy patients in their charge who would appreciate such a visit.

The scheme has useful possibilities since recovery from serious illness may well be delayed on account of personal worries, which a visitor from the Merchant Navy Comforts Service, who for preference should be a retired Merchant Navy officer, can do much to solve.

Games, books, clothing, and cigarettes are supplied to patients. One form of medical treatment having prescribed the smoking of 40-50 cigarettes per day, arrangements have been made for a duty-free delivery of this far from disagreeable medicine through the co-operation of the British Red Cross. Where necessary, a patient's problems can be passed on to the appropriate authorities, association or union, where such action is indicated. As the scheme progresses and the services of appropriate visitors secured, it is hoped to extend this service further afield.

At national appeal headquarters, 62, Heath-street, London, N.W. 3, the postman has kept us busy. The incoming mail is an inspiration. Children are among our most active supporters. A little girl wrote recently, "I am starting an 'orange fund' to thank the Merchant Navy for the oranges I receive." A Berkshire lady collected mushrooms, and in doing so a cheque for £248 for our work. A Somerset farmer has given a pedigree bull.

Sir Robert Graham, chairman of the International Tea Committee, last year renewed his appeal to the tea industry with substantial results, which are still growing as this is written. The theatrical world has been as grand as ever.

The first telephone call in 1942 was from Lupino Lane, who said, "I am going ahead with the Lupino Lane Ship Ha'penny Fund." Since then, by appealing from the stage at the end of each performance of "Twenty to One" at the Victoria Palace, the famous little comedian who put the "Lambeth Walk" on the map, has put more than £5,000 in the bank for the Merchant Navy Comforts Service. Miss Anna Neagle has helped both in England and Canada. Mr. Will Fyffe, C.B.E., has taken the Merchant Navy Comforts Service on tour with him throughout Great Britain. The Press, too, have been most generous. The publishers of *The Journal of Commerce and Shipping Telegraph* have produced "Our Merchant Ships," our small magazine, alternatively for the Merchant Navy Comforts Service and its parent society, the British Ship Adoption Society, in spite of many wartime difficulties. National advertisers, including many shipowners, have been generous with donations of free space both in the Press and on hoardings.

Space forbids more than a passing mention of other exciting news items of the year. The Right Honourable Viscount Bennett, P.C., in September agreed to become deputy-chairman of the Merchant Navy Comforts Service. A Merchant Navy week, undertaken by our workers at Cannock Chase with a target of £1,500, produced no less a sum than £4,500, averaging precisely 5s 6¼d per house in this mining district. Norman Armstrong, the author of the Merchant Navy play "Lifeline," recently produced at the Duchess Theatre, has agreed to devote the profits from the publication of the play to the work of the Merchant Navy Comforts Service.

At the end of this story of a Royal year comes the most inspiring news of all. Mr. Edmund Watts, our chairman, received a letter headed Windsor Castle and signed by Sir Ulick Alexander, Keeper of the Privy Purse, which reads:

Dear Sir,

You will, I feel sure, be glad to hear that the King desires me to let you know that his Majesty is anxious to give a yearly contribution of £100 to the Merchant Navy Comforts Service. I therefore write to let you know that I have instructed Messrs. Coutts and Co. to pay this amount annually to the account of this fund at the National Provincial Bank, 15, Bishopsgate, London, E.C. 2.

Yours truly,
ULICK ALEXANDER.

So the work goes on: King and commoner uniting to pay tribute to the officers and men whose business it is to go far out and home and out again, fetching and carrying till the day of victory and after: for our island kingdom must ever depend upon the officers and men of the Merchant Navy.

The Merchant Navy Comforts Service is at once an organisation and a sincere, practical "vote of thanks" to those who sail the Seven Seas.

Distributing comforts among the crew.

Photo by courtesy of Messrs. Harland & Wolff, Ltd.

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Towards a Greater Measure of Safety of Life at Sea

SINCE the last issue of the ANNUAL REVIEW of *The Journal of Commerce and Shipping Telegraph*, the war-time rules and requirements in regard to life-saving appliances in merchant ships have been consolidated in a new code of rules made by the Ministry of War Transport under statute. This code included a number of new compulsory requirements and came into operation on August 10, 1942. It was published by the Stationery Office as a Statutory Rule and Order (No. 1519) under the title of "The Merchant Shipping (Life-saving Appliances) Emergency Rules, 1942."

The new rules also gave legal effect to the requirements announced in a Ministry of War Transport memorandum with regard to measures for the increased comfort and protection of occupants of lifeboats and rafts, and means for the protection of crews of tankers from burning oil. Most of the measures included as recommendations in Notice No. M.191 issued by the Ministry were made compulsory, and a number of new requirements were imposed upon sea-going merchant ships and fishing boats. In view of the extension of the area of the war, the rules are not restricted in their application to any particular zone or zones, but apply, except where otherwise specified therein, to all seagoing ships irrespective of the area in which they trade. The rules are not applicable to troopships.

The requirements of the memorandum referred to in the opening paragraph of this article, which are now compulsory, include a manual pump of an approved type for bilge pumping as part of the equipment of every lifeboat; a supply of one gallon of fish, animal or vegetable oil or other approved substance for massage purposes, to be kept in a properly labelled container in every lifeboat in foreign-going ships as well as on emergency rafts; a new scale of food rations and drinking water for lifeboats and rafts; weather protection on rafts consisting of approved means of affording the occupants protection against being washed off by heavy seas and protection from the weather, including weather clothes, canvas awning coloured yellow or bright orange, and waterproof bags sufficient for the total number of persons the raft may carry; a suit of protective clothing of approved type designed for carriage on the person and suitable for wear in a lifeboat or emergency raft, together with a reserve supply of such suits equivalent to 10 per cent. of the total number of the members of the crew carried in the ship; and special anti-fire equipment and asbestos blankets for lifeboats and flame-proofed garments for crews of oil tankers.

With regard to Notice No. M.191, to which reference has also been made, the recommendations contained therein and now in force include means to prevent lifeboats being unhooked, and provision for tank cleaning to be readily removable; security of radial davits; provision of light heaving lines, smoke signals, sewing outfits, repair outfit and bunting flag; security of lifeboat equipment; stowage of rafts and buoyant apparatus; provision of rope ladders and side nets; provision of remote control of engines and of pumps; provision of alternative means of escape; supply of repair materials; filling of air cases with buoyant material; and arrangements for warning crew of abandonment of ship.

New or amended requirements include the provision of davits fitted with turning out gear; security of lifeboats carried outboard; fitting of fairlead and protection of sea anchor hawser; fitting of approved means of launching lifeboats against an adverse list, e.g., skates; installation of motor in second lifeboat; provision of lifelines; provision of bilge rails, grab lines and water containers, supply of additional bucket; provision of yellow or orange-coloured canvas hoods and screens; supply of spare bulbs and batteries; supply of whistles with lanyards; supply of additional emergency rafts; provision of protective waterproof bags, sea anchor, electric signalling torch, approved first-aid outfit, and clasp knife; supply of lifejacket lights, including lights for passengers, and a reserve of lights, batteries and bulbs; restriction of numbers carried in boats during process of launching; and stowage of rafts and provision of additional ladder in oil tankers.

Some of these new requirements call for special comment. First, it is now compulsory for all lifeboats attached to davits to be fitted with approved means of launching them against an adverse list. The types of skates approved for this purpose are (a) the Hunt pattern, (b) Schat pattern, and (c) the Ministry pattern. The Ministry design is intended for construction from materials usually available on board ship, and plans of it may be obtained from Ministry surveyors' offices. Any of these types of skates may in future be provided by managers in ships owned by the Ministry.

The general exemption granted under previous rules which permitted the acceptance in ships of Class 1 of a specified reduction in buoyant apparatus, is no longer operative. Under the new rules each ship will be considered on merits, and owners should accordingly submit their proposals in the matter to the nearest marine surveyors' office of the Ministry of War Transport. The effect of the rules is to require the provision of lifeboats and rafts, which afford support out of the water, to the utmost extent which the circumstances will reasonably permit, and to authorise the use of buoyant apparatus only so far as boats and rafts cannot reasonably be provided. In each case the surveyor will certify in writing the numbers of lifeboats, rafts and buoyant apparatus accepted by him; and where they are not sufficient, owing to lack of adequate stowage, to support all persons on board as required by the rules, he will grant the requisite exemption.

As to lifeboats, it is provided that one of these must be a motor lifeboat fitted with approved means of propulsion and provided with sufficient fuel to enable the boat to make a voyage of 160 miles; in ships carrying more than 30 passengers two such lifeboats shall be so fitted.

Another new requirement for lifeboats is a sea anchor of approved size. Several cases had been reported to the Ministry in which lifeboats were found to be provided with sea anchors smaller in size than was required by paragraph 132 of the Instructions as

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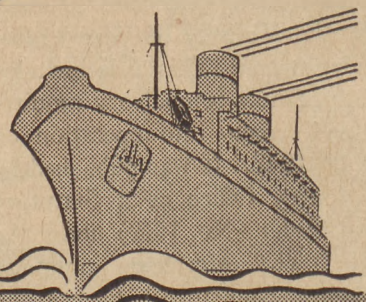

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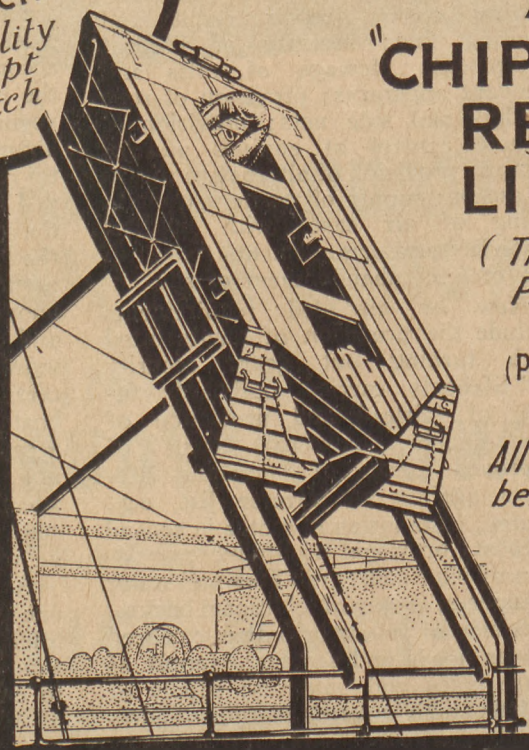

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to the Survey of Lifesaving Appliances. In future the sizes are not to be smaller than the following:—

Lifeboats not exceeding 22ft. in length; area of mouth of sea anchor, 452 sq. in.; lifeboats exceeding 22ft. in length but not exceeding 30ft.; area of mouth of sea anchor, 572 sq. in.

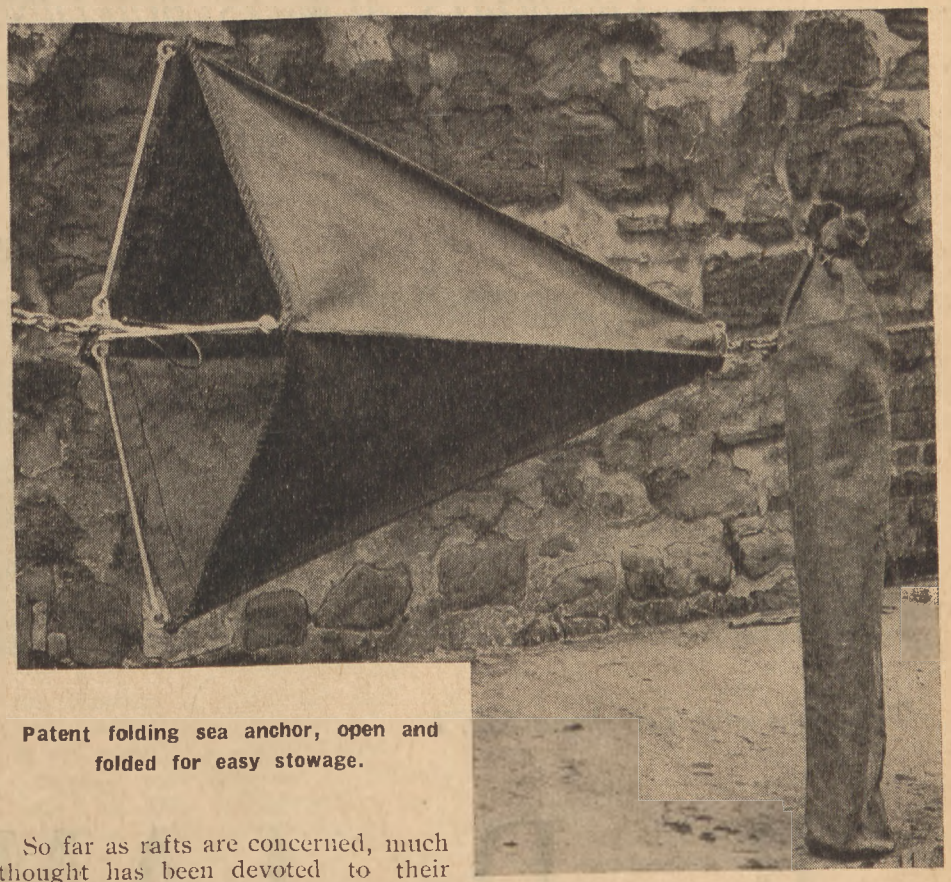
That the old type of sea anchor was not altogether efficient was indicated by the experience of the master of a British ship who brought his lifeboat through six days of gale until the survivors were picked up. He stated that when his ship was torpedoed the four boats got away without incident, but almost immediately the lifeboats ran into a gale which lasted for 60 hours. The sea anchor, which is normally used for steadying a lifeboat in such towering seas, refused to work. The master then used an iron bucket as a sea anchor. Attaching it to 60ft. of line, it was thrown overboard, and during the whole 60 hours of the storm it held this small lifeboat, in which 15 men were battling bravely against mountainous seas, facing steadily north. The master said, "The storm was a tremendous one and I proved that the old-fashioned type of canvas sea anchor was useless. A different type has now been adopted."

As to the equipment of emergency rafts, the rules call for "a folding sea anchor in waterproof cover and a hawser of 2¼in. rope approximately 10 fathoms in length.

A photograph of a new type of folding sea anchor, which is part of the equipment of the Chipchase lifecraft, is reproduced with this article. This is stowed in the double bottom in a watertight canvas cover and is made ready for use by sliding up the centre collar and fixing split pin to lock. It can be fastened to the end of raft painter, which is attached to the lifting plates at bow. The raft will then hold itself up to the weather, using steering oar as desirable.

The raft has been described as "the seaman's second line of defence," but quite a number of ships' officers and seamen, some of whom have already had to take to their boats, state definitely that, under modern conditions, they would be prepared to trust their lives to the latest type of raft rather than to the lifeboat. There are, of course, several types of raft manufactured by various firms to meet official requirements, and it will be remembered that in 1939 the Ministry introduced a standard design of an emergency raft which could readily be made on board ship with the minimum expenditure of labour and materials. Many of these rafts were constructed on board and used to supplement the lifeboats until makers had had time to construct sufficient rafts to meet the heavy demand.

Under the new life-saving rules it is required that the "approved emergency rafts and buoyant apparatus" to be carried shall be sufficient to support all persons on board. Approval under these rules has been given to the following emergency rafts, and no others may in future be supplied without the prior consent of the Ministry:—Acme Raft—Hills Construction Co., Ltd., South Shields; Chipchase Raft—Tyne Dock and Engineering Co., Ltd., South Shields; Dab Emergency Raft—Ministry of War Transport; Harrocks Raft—Cock's Reinforced Hatch Covers, Ltd., Cardiff; Spoonfos Life-saving Craft—Messrs. Spooners, Hull; Wearside Emergency Lifecraft Wearside Boatbuilding Co., Ltd.



Patent folding sea anchor, open and folded for easy stowage.

So far as rafts are concerned, much thought has been devoted to their construction, and the writer of this article recently had an opportunity of interviewing Mr. R. S. Chipchase, the inventor of the raft which is known by his name and discussing with him the various improvements which had been made in the light of three years' experience of war at sea.

Mr. Chipchase stated that in the early days of the war he had set out to try and solve the raft question, which he felt would become increasingly important as the war progressed. Rafts of a kind were being rapidly made available, and the first problem he tackled was the immediate one, how and where best to stow the rafts to permit them to be got into the water with ease and speed in emergency, regardless of weather conditions. Large rafts could not be launched at all in some cases, and only by laborious man-handling with considerable danger in bad weather in others. They were generally stowed on deck, took up a lot of space and valuable time during each loading and discharge.

With these big rafts, therefore, the crew had to wait until the vessel sank under their feet with the risk of their being dragged into the vortex or of the raft fouling the masts and rigging as the vessel sank. Again, if the vessel was a tanker, they could not get away from floating oil with its danger of fire, and with a vessel on fire and the boats unavailable to have men waiting on deck until the vessel sank or jump into the water pending the possible floating of raft was to Mr. Chipchase unthinkable. Further, with a vessel wrecked on a sandbank or on rocks off shore, the men would, most likely, be left to jump into stormy seas in the hope of getting washed ashore.

It appeared to him, therefore, that a number of medium utility rafts, i.e., rafts of all-round utility to meet any circumstances, which could be instantly

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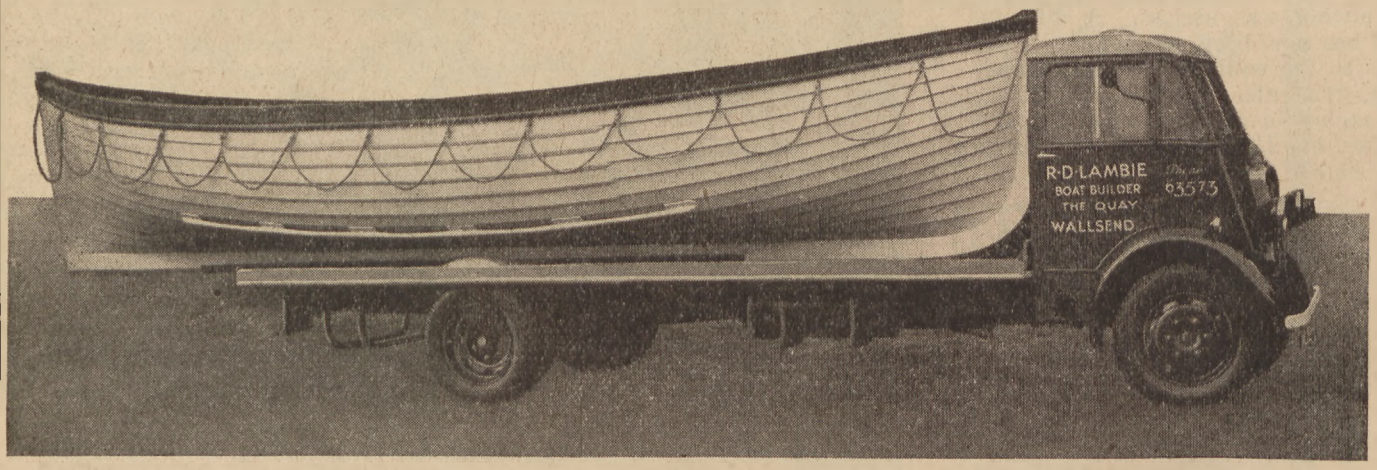

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launched and available at various parts of the vessel, were more desirable than a large unwieldy one with "all the eggs in one basket." He designed the "Always Ready" life-raft stowage and launching system with this type of raft particularly in view, although it can, of course, be adapted for larger rafts if desired.

This system overcomes the difficulties mentioned previously; by it the rafts are stowed in safe and seaworthy positions clear of the decks and can be launched very quickly. Alternatively, in the event of a vessel sinking before the release can be reached, the rafts will automatically float unaided and be available for any men in the water. Further, in convoy or rescue work, any number of rafts can be instantly shed and drifted to their object with minimum risk to the vessel.

This method was fully tested in January, 1940, and approved by the Ministry of Shipping (now Ministry of War Transport) and has now become almost standard in the Merchant Navy as well as in many allied vessels, and a large number of lives have already been saved by it. As a matter of interest the *Ocean Vanguard,* the first vessel built in America for this country, is reported to have this system for her life-rafts.

Mr. Chipchase then turned his attention to the life-rafts. Whilst the Ministry raft had done good service, it soon became apparent from increasing cases of hardships and exposures that something better was demanded—and promptly. There was a case brought to notice of a raft which originally had 12 men on it, but in the bad weather they could not withstand the exposure, and one by one they were lost until eventually only one man survived. This was due largely to the fact that rafts were unnavigable and had little or no protection against exposure.

It appeared that there was a great need for something between the lifeboat and the ordinary raft, i.e., a craft which would have many of the amenities and as much of the navigability of a lifeboat as practicable plus the ability to withstand crash-launching in emergency from a great height, and to float right side up and remain fully accessible whichever way it entered the water. If possible, it was desired to prevent the helpless and many times hopeless drifting of seamen entirely at the mercy of the elements until picked up. No one could foretell the manner in which a ship would sink or the weather conditions to be met, so the raft had to be of a type able to meet any possible combination of circumstances.

What, then, was the ideal life-raft system? Mr. Chipchase summed it up as follows:—

1. All rafts to be ready for instant use in any conditions regardless of weather, i.e., able to be launched instantly.
2. Rafts must be unsinkable, proof against machine-gunning, and float right side up whichever way they enter the water.
3. Strong enough to withstand emergency crash-launching from the maximum height of an unloaded ship.
4. To be as navigable as practicable, namely, have a stem and stern, and able to sail, row or be towed, or use outboard motor.
5. Have stowage accommodation to carry food, ample water in various compartments (for prevention against leakage by machine-gunning and security against contamination by salt water whilst serving).
6. All gear, waterproof bags, medical supplies, mast, sail and oars, &c., to have adequate safe stowage to withstand launching and to be easily available whichever way the raft floats. Some of this gear might be transferred from unusable lifeboats, time permitting.
7. Raft to have facilities so that it can be easily boarded from the water by a weak person. In this respect it is well to bear in mind the difficulty of even a fit man boarding the average boat or raft, apart from a numbed, injured, or physically weak person, in the water.
8. Full protection to be provided in the raft against the elements.
9. Automatic floating to be provided for any extreme emergency.
10. Ship's deck space to be interfered with as little as possible.

Based upon these findings Mr. Chipchase designed a new craft, which was fully tested and approved by the Ministry of Shipping, and was demonstrated on February 12, 1941, at the request of the Ministry of Shipping and Ministry of Information. At this demonstration in a northern port the lifecraft was instantly launched from the "Always Ready" launching ways on an 8,000-ton vessel from a height of 36ft. into rough water, and was boarded by sailors from the ship's deck all inside one minute. These men then rigged the mast and sail, erected the wooden storm hood, fitted the wooden protective bulwarks on port and starboard sides in two-and-a-half minutes. In a very short while the sail was taken down and the overhead awning erected, giving protection to all the occupants.

At the same demonstration a man jumped from the ship's deck, swam to the raft and boarded it unaided over its specially shaped stern, and was on his way back to the vessel to change inside two minutes. This was all timed and witnessed by Ministry of Shipping surveyors, owners, marine superintendents, consulting engineers, ships' officers, and many other interested parties. The raft was then brought aboard, examined and found undamaged.

This lifecraft is rigged with either a dipping lug or square sail, has optionally pivoted leeboards, carries oars, specially designed folding sea anchor for riding to bad weather, and provision is also made for special leg protection which keeps men's feet, legs and lower parts of their bodies dry and warm. The idea was to have a national standard raft which could be mass-produced economically, manufactured quickly, and easily available at any port.

With this in view Mr. Chipchase handed the designs over to the Ministry of War Transport, and already hundreds of these rafts are in use as well as thousands of the launching ways with various types of rafts.

Special reference has been made to this one particular raft but the same considerations and principles apply to other designs, and as a result the different makes mentioned above as having been approved by the Ministry of War Transport have been successfully developed as effective for saving and maintaining life at sea after ships have been lost by enemy action.

The "waterproof bags" required as part of the equipment of emergency rafts are worthy of mention. The Ministry of War Transport say they should be strong enough to stand the wear of the men's boots; they should extend to the armpits and be provided at the top with readily removable means of securing them between the occupants, such as wooden pegs. They should be designed for three, four or six persons each; to suit the seating arrangements of the rafts.

In this connection it is to be noted that inside the double bottom of the Chipchase lifecraft are four canvas bags which can be pulled over the legs and up to the waist forming watertight protection to legs and the lower parts of men's bodies. It is desirable for as many men as possible to enter these bags so as to get the benefit of communal warmth, using seamanlike precautions. Wooden pegs are provided to close the mouth of the bag between the individual members to retain warmth and keep out water, and can be instantly released in case of emergency. These bags can be used as

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separate protection for an injured man if desired.

This idea of "communal heat" is not new in the world of nature. Dwellers in sheep-farming districts will have noticed how in cold weather sheep huddle together and the "communal heat" engendered keeps the flock safe and warm even during the depth of winter when snow is falling heavily, but its adoption in rafts for human beings is certainly novel.

The Ministry of War Transport has also issued a circular for the information of seamen describing the symptoms and treatment of immersion foot and frostbite.

Towards the end of May the U.S. Maritime Commission sent a notice to all American ship surveyors listing the various safety appliances and measures which must now be carried in or given effect to in American merchant ships; a number of these are similar in many respects and details to those which were some time ago initiated by our own Ministry, whose officials must, therefore, find encouragement in the confirmation that their experiments and research have been conducted and concluded on the right lines.

A few instances in which the new American rules are identical with our own may be mentioned. It is now compulsory on board both British and American sea-going ships for provision to be made to stop the main engine, if required, by means of emergency control conveniently situated outside the engine-room, also for the remote control of pumps liable to discharge into lifeboats during launching operations.

The American rules for carrying lifeboats in the outboard position and fastened in such a way that they may be lowered immediately in case of emergency are similar to our own, as are the provision of first-aid kit in lifeboats and rafts, an electric light which can be attached to the life jacket or life-saving waistcoat, emergency flashlights for signalling, a whistle and jack knife for every person on board, lifelines on boats, rope ladders and rope nets on each side of the ship to facilitate entry into the boats when waterborne, emergency lights, portable radio transmitters for lifeboats, and emergency escape ladders from engine-rooms, stokeholds and crews' companion ways.

The incorporation in the American rules of so many of our own requirements is a testimony to the valuable work which the Ministry of War Transport has carried out and put into practice, and denotes how each nation is able in many ways to help the other and pass on the benefit of its experience whether it refers to actual warfare—in dealing with submarines and raiding aircraft—or to research work carried out in laboratories and offices.

The Norwegians and the Dutch have described the British life-saving rules as exemplary. It is to be noted, however, that where our Government is providing hand rockets at the public expense for all lifeboats and rafts, the American rules demand the provision of a signal pistol and 12 approved parachute red signal cartridges.

Many of the new appliances which have been provided as a result of war-time experience had their origin in an idea born in the mind of a Ministry of War Transport officer. Take, for example, the provision of a little red light which can be worn in the buttonhole of a life-jacket and enables the wearer to be picked up out of the water in the pitch black darkness of night.

Mr. P. J. Noel-Baker, M.P., Parliamentary Secretary to the Ministry of War Transport, has said that six weeks after the introduction of small lights to be worn on seamen's life-jackets 400 lives had been saved. The small light is operated by a waterproof battery and is clearly visible in the darkest night in winter. Another illustration of the value of these "little red lights" was provided when one of our ships on patrol in the South Atlantic at night recently saw a considerable distance away a red light which at first was thought to come from a burning ship. The patrol vessel immediately turned and steaming full speed towards the light found that it came from the red lights clipped to the life-jackets of a number of seamen whose ship had been torpedoed about two hours previously.

It had been impossible to launch any boats or rafts, and the men were altogether in a bunch in the water. The light must have been observed from a distance of between eight and 10 miles. But for the lights every man would probably have perished, as there were no other ships in the vicinity.

The little red lights proved their value from the start, for the first ship's crew to whom they were issued were torpedoed soon after and were rescued from the water. Many of them declared that had it not been for the light they would not have been found. In fact, the crew insisted upon a letter being sent to the Ministry thanking them for having initiated the manufacture of such a device.

And then there are the buoyant smoke signals which are capable of giving off a volume of orange coloured smoke. This new flare was instrumental in saving the lives of over 300 persons. A passenger ship carrying 335 passengers and crew was torpedoed. They took to the lifeboats and rafts. The following day they saw a seaplane flying high, and sent up the smoke signal. The pilot came down low but was unable to land on the surface of the water. He dropped a message attached to a buoy saying he would go for assistance, and within a few hours a merchant ship and a warship were on the scene. The total loss in the ship as a result of the explosions from the torpedoes and everything else was only 20. The yellow smoke given off by the signals is visible from a considerable distance. It is compulsory to carry them in all lifeboats and rafts.

The officers of the Ministry receive information at first hand from the men at sea, and in this way are able to gauge the requirements which make for greater safety; and from this, given the demand, they set out to satisfy it. Recently they have been inquiring whether it is possible to evolve a small distilling plant which would occupy but little space in a lifeboat or a raft; and it is understood that the outcome of such thought and research is very promising and that results will be apparent before this article has long been in print. Many difficulties had to be overcome both in respect of fuel and burner, but many inventive and enthusiastic minds worked on the problem to achieve success.

The writer of this article is not aware of the limitations of size which it is officially thought necessary to place on distilling plants, but it may be remarked that there is certainly one water producer on the market which does not make extravagant demands on available space; it stands 17ins. high by 8ins. diameter and produces 4-5 pints of water an hour. The makers of this appliance, which is known as the "K.M." water producer, started from the assumption that a distiller dependent upon patent fuel, oil fuel, paraffin or petrol would be a liability rather than an asset in the event of the fuel supply failing or being lost as a result of damage to lifeboats by enemy action.

They therefore concentrated upon the production of a plant that would need only the fuel likely to be available in largest quantity—wood. The normal rate of fuel consumption is 4-5 lbs. of wood per hour, so that a 16ft. oar would provide sufficient fuel

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to make some 25 pints of water. Producers of this make have already been supplied to many well-known shipping companies in this country.

Another device which has been brought to the notice of the Ministry of War Transport is a combined pump and spray devised and patented by a Manchester Ship Canal pilot, the object of which is to ensure equal and effective distribution of possibly limited supplies of water to all the occupants of a ship's lifeboat. It is obviously difficult to distribute water at the rate of a teaspoonful at a time to, say, 30 people in succession; there must be a risk of some of it being lost or, more serious, the risk of the main supply being contaminated by salt water if the lifeboat shipped a sea when a water tank was open to allow a quantity to be drawn off.

The elements which constitute this apparatus are simple—a ball valve in the water tank, water pipe and air line and pump, hand operated, with which is embodied the spray. The latter is inserted in the mouth and, when the pump plunger is actuated, sprays one teaspoonful of water round the mouth.

The ball valve in the tank is not fixed, so that it will always be in the fresh water even if the tank is overturned, and once it has been put in place with the water pipe and airline, the tank need not be opened until all the water in it has been consumed; in this way the risk of salt contamination is removed. In the pump there are two more ball valves, the first to admit the specified quantity of water into the pump and the second to transfer it from the pump into the mouth. The pump plunger is raised to draw in water and when it is released the vital teaspoonful of water passes through the spray.

The air and water lines are long enough for the spray to be passed the full length of a lifeboat or to reach to the keel in the event of the boat being overturned. The pump, normally, would be attached, when not in use, to the gunwale, and for additional security it is provided with a lanyard for fastening to a thwart.

A notice to shipowners and shipmasters, issued by the Ministry of War Transport, describes and gives instructions for the use of Neil Robertson stretchers, two of which are to be carried on board every foreign-going merchant ship. The existing Merchant Shipping Medical Scales I. and II. require that an efficient carrying stretcher of approved type shall be carried, the notice states.

After consultation with representatives of the various organisations in the shipping industry, the Ministry have decided that under war conditions two stretchers of the Neil Robertson type shall be carried on every foreign-going vessel. This type of stretcher is agreed to be specially efficient, since a patient can be carried in it in difficult conditions without being liable to roll or slip out of it at whatever angle the stretcher is carried.

Efforts to improve still further the life-saving attributes of ships' lifeboats are shown in the accompanying illustration of a 26ft. motor lifeboat. A departure from normal will be noted in the built-up topsides forward and the provision of a short forecastle deck. This design has been evolved by the Lamport and Holt Line, Ltd.

There are two underlying motives behind the design, one being to increase the righting moment of the boat with a view to making it as nearly self-righting as possible, and the other to provide additional cover for the occupants and of a more permanent character than canvas topsides and hood.

As regards the first of these two points, an extra buoyancy tank is incorporated in the forepeak as high up as possible; the petrol tank at the after end of the boat also helps to provide buoyancy for righting if the boat should capsize. The boat, as illustrated, is not fully self-righting, but certainly goes a considerable way in that direction. The shelter extends about 7ft. aft, the stem piece of the boat being 12ins. higher than normal. The deck is pierced to allow the lifting hook to be secured to the keel as in a normal boat. The deck is high enough to provide sufficient head-room and long enough to seat comfortably eight persons on fore and aft seats.

Forward of the mast a square embrasure is cut in the deck to permit easy access to the lowering falls so that the hook can be easily disengaged; hand-holds are also provided in the event of it being necessary to climb on deck for this purpose.

The after part of the deck provides a firm abutment for the canvas top and sides with which all lifeboats are now equipped. The extra rigidity thus provided makes the canvas screens more effective in keeping the boat and occupants dry as well as increasing the seaworthiness of the lifeboat.

All the new boats for ships of the Lamport and Holt Line in future will be to this design, which has been passed by the surveyors of the Ministry of War Transport.

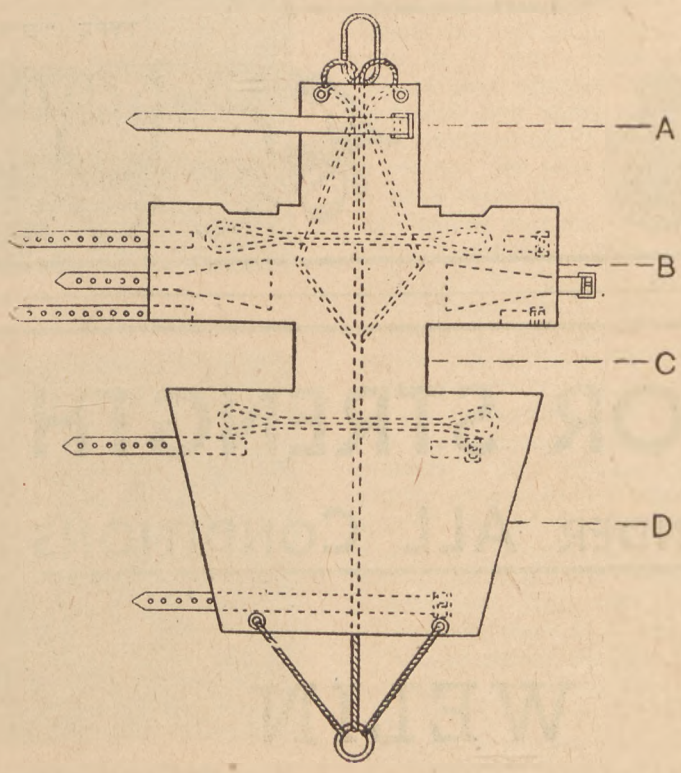

Diagram of Neil Robertson stretcher.—A: Portion for the head and neck 17ins. long and 12ins. broad. B: Portion for the chest 14ins. long and 42ins. broad. C: Portion for the small of the back 6½ins. long and 14ins. broad. D: Portion for the hips and lower limbs 27½ins. long and at the upper end 38ins. broad and at the lower end 25ins. broad.

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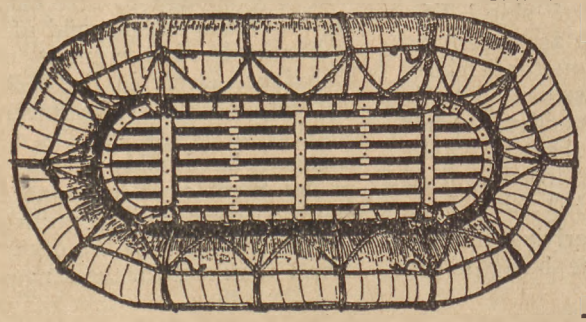

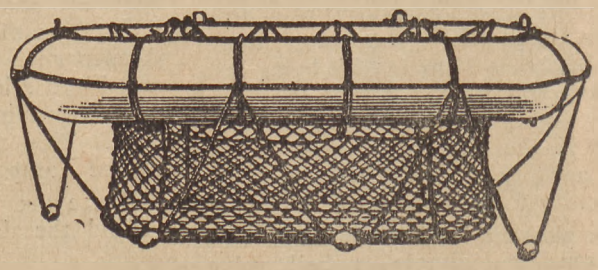

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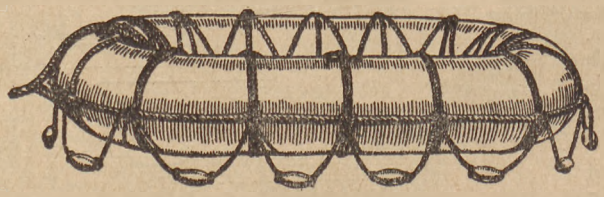

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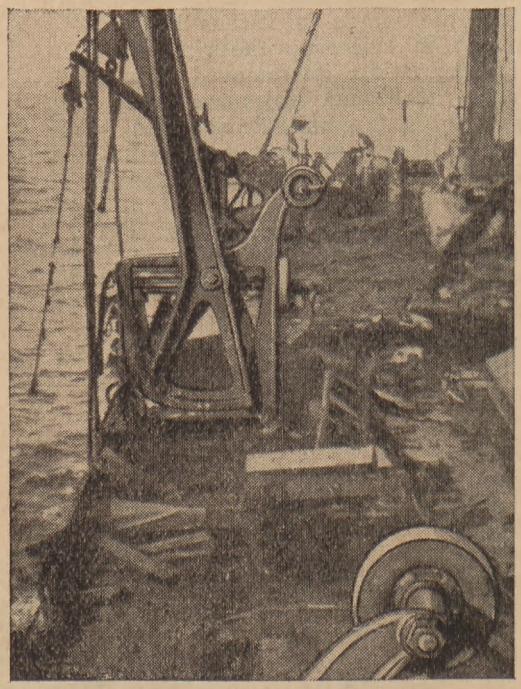

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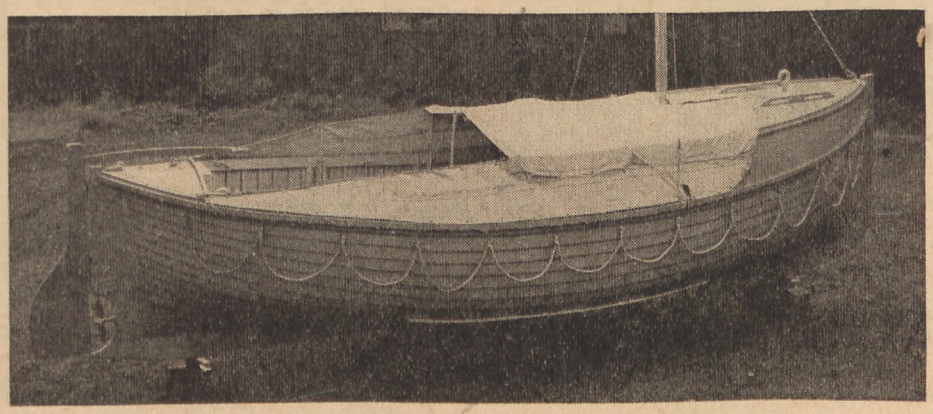
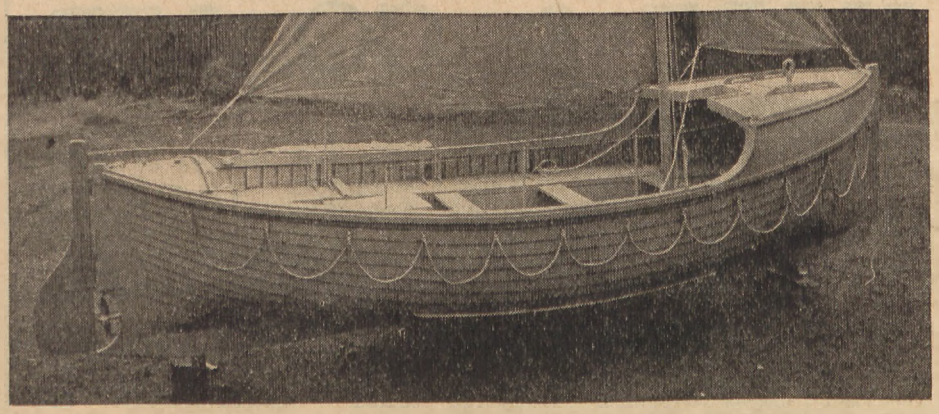
Suits of protective clothing must now be provided for all persons on board a foreign-going ship, whether they are members of the crew or passengers. No description of the American suit is available, but it is known that before the British suit was adopted by the Ministry of War Transport many men who had been cast away in lifeboats were consulted. These water-proof and wind-proof suits are a bright yellow, a colour which can easily be seen from the air. Each consists of a combined jacket and hood and combined trousers and overshoes. As the whole outfit folds into the hood it can easily be carried on the back when the ship is in the danger zone, so that a seaman can be sure of having it with him should he have to take to the lifeboats or rafts. Mr. T. E. Metcalfe, O.B.E., of the Ministry of War Transport, was awarded the Thomas Gray Memorial Trust Prize by the Royal Society of Arts last April for the invention of the protective suit; this is an annual prize which is awarded for "an invention advancing the science and practice of navigation." Suits are supplied by the Ministry to all seamen at the expense of the Government.

An article in *The Journal of Commerce and Shipping Telegraph* a short time ago told of the experiences of a number of British seamen who had been compelled to spend 34 days in a raft at sea, and one of these survivors mentioned that their cramped positions made sleep impossible. It was the recognition of the fact that men suffered from cramp when unable to exercise their limbs that was responsible for a zip-fastener being sewn to the trouser legs of these protective suits so that an opening could be made for a man to insert his hand and rub his leg. These are small things, but they are an indication of the thought given to such matters.

It would require many pages to detail fully all the new safety rules and lifesaving appliances which are now compulsory in British ships. There are special requirements for oil tankers, and it will be appreciated why it has been ordered that the tankers' lifeboats shall be constructed of steel. Each member of the crew of a tanker is provided with a suit made of fire-resisting material and designed for carriage on the person.

The equipment of lifeboats and rafts is most comprehensive, and includes among many other seemingly more important articles, things like oil for massage purposes, a set of charts covering the globe in water-proof case, rust-proof drinking vessels, one graduated in ½, 1 and 2 ozs.; but perhaps sufficient has been stated to show the thought and attention to detail which has been exercised in compiling these safety rules and regulations. As Mr. Noel-Baker has said "everything possible for the safety of life at sea is being done."





Lamport and Holt Line's design of lifeboat built up and decked forward, with and without protective hood and side screens in position.

Although not part of the compulsory equipment of merchant ships, an appliance which has proved useful from a safety point of view and has also added to the efficiency of ocean-going ships, is the Ardente loud hailer. Frequent references to this instrument, which is a very advanced form of loud speaker, have been made in the sea literature of the war, especially to its use in naval vessels.

These hailers have a range of up to seven miles in favourable weather conditions and can be heard a mile away even in a gale. Some progressive owners have installed the instruments on board their ships and, apart from the advantages which they confer while in convoy, one ship recently was able to save three days in docking when approaching port in this country. The dock master was under the impression that the draft of the ship was much deeper than it actually was and, accordingly, ordered the master to remain out in the river. In a report to his owners the master stated, "on informing the dock master of my correct draft through the medium of the Ardente, I had the satisfaction very shortly afterwards of hearing 'Come ahead.' It had thus saved at least 24 hours as otherwise, at best, a berth would have had to be found for us in a congested dock, or else wait for spring tides three days later."

Advantages of the hailer have been summed up by a shipmaster as follows:

1. When the vessel is the commodore ship it enables the Commodore to talk freely and directly with the leading destroyer (who uses a similar instrument) thereby transmitting signals with greater speed than if transmitted by visual signals. Incidentally, one Commodore remarked that it was a most useful instrument to have on board.

2. In coastal convoys where there is a warship fitted with radio location, signals can be transmitted through the loud-speaking megaphone from the location ship, thereby saving valuable time in giving bearings. Normally, these bearings would be transmitted by signal, phoned from the wireless room to the bridge, and then passed on to the gunners aft.

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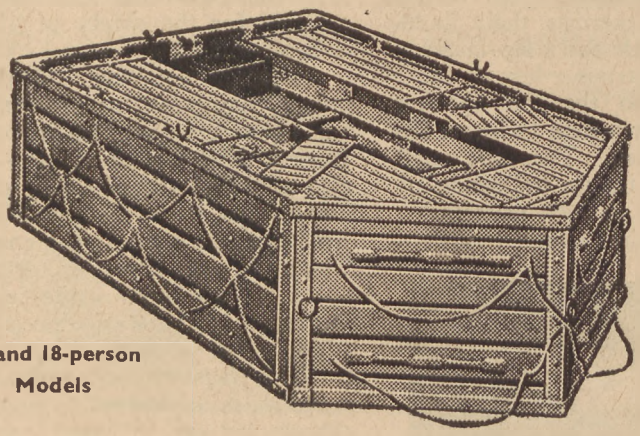

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3. When sailing in convoy, if either of the vessels abeam come too close, a few words through the megaphone prove very effective.

4. When entering port, ships are now stopped and hailed by the examination vessel for certain information such as draft, &c., and the use of the electric megaphone often eliminates unnecessary manoeuvring to get within hailing distance of the examination vessel; in fact, in the case of my ship recently, valuable time was saved in connection with the docking of the vessel.

5. On the North Atlantic run the passing of signals through the foggy atmosphere which often prevails is greatly facilitated by the use of the electric megaphone.

Convoy officer giving verbal instructions through Ardente loud hailer, the electric megaphone being shown inset.

Thus have been outlined the additional devices and improvements in equipment which have been brought into use to provide better security for those who maintain our sea communications in the face of the enemy's ruthless, vicious attacks by any means that lie ready to his hand. War has, indeed, speeded inventive genius in this respect, and there is some satisfaction in the knowledge that the experience thus gained in time of tribulation and severe trial will not be lost when peace returns and normal commercial trading, free from the exceptional perils of war, is again possible.

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Keeping clear the Ocean lines of communication

by our Naval Correspondent

FOR the first time since that fateful Sunday morning in September, 1939, when Mr. Neville Chamberlain informed the British people that they were again at war with Germany, the year lately ended brought the first signs that our faith in ultimate victory was justified and that our hopes would be realised. The autumn of 1942 saw the turning point of the war. Sea power, maintained by "ships that sail on the surface of the sea, ships that move under the surface and ships that move through the air," had triumphed. The greatest armada in history carrying Allied troops to a new theatre of war was convoyed safely over thousands of miles of ocean to its destination and the soldiers and their equipment landed on foreign soil.

We are now in the fourth year of the war, which has been carried on with varying degrees of intensity for three years and four months. For over two-thirds of that period Britain stood alone facing the mightiest army the world has ever known. After the fall of France we were practically open to invasion but the gallantry of our Air Force and our command of the seas kept the enemy at bay on the other side of the moat which flows around our island fortress.

Failing in his attempts to knock out our Air Force, the enemy unleashed his fury and hatred upon the civilian population of Britain in attempts to break their morale, and intensified his submarine and air attacks against our shipping hoping by such means to starve us into submission. But the heads of the British people although bloodied were unbowed. Behind their moat they set themselves to labour with a will in producing the munitions of war which were necessary for victory, fully confident that right would triumph in the end.

That period from the time when France collapsed in June, 1940, to the end of December, 1941, proved the mettle of the British people and their determination to carry on to the death rather than submit to the evil forces which would enslave the world. They held aloft the torch of liberty and so long as this was burning there was hope for the world. The courage and will, the endurance and undaunted assurance of the common people and their leaders, evoked the admiration of all nations except the Axis countries. Then came to the great democracy on the other side of the Atlantic the realisation that our fight was theirs; that the defeat of Britain would eventually leave America alone to face the increased strength of the would-be conquerors of the world. With his new gains Hitler would have been able to build up a sea and air force which would have proved invulnerable.

American statesmen saw the danger and the result was that in response to Mr. Churchill's request for the "tools" to continue the fight American industry was harnessed to the war effort. Under Lease-Lend arrangements, aircraft, tanks and other weapons of war were placed at the disposal of Britain and the other nations which were facing the aggressor. From non-belligerency the United States passed to friendly neutrality and, fearing that American factories would be used increasingly in the production of weapons of war for Britain, Russia and China, Hitler encouraged his eastern partner to declare war upon America in order to ensure that the obligations of that country would probably occupy the full facilities of American industry and labour for her own defence.

The past year, therefore, opened with two new belligerents—the United States on the side of the Allies and Japan linked up with Germany and Italy. Japan, like her two partners in infamy, expected that the forces she had built up during the period when the United Nations were pursuing the path of peace would be sufficient to deal a crippling blow in the first round. In a short while she was in possession of bases across the Pacific and in occupation of Burma, Malaya, New Guinea and Dutch East Indies

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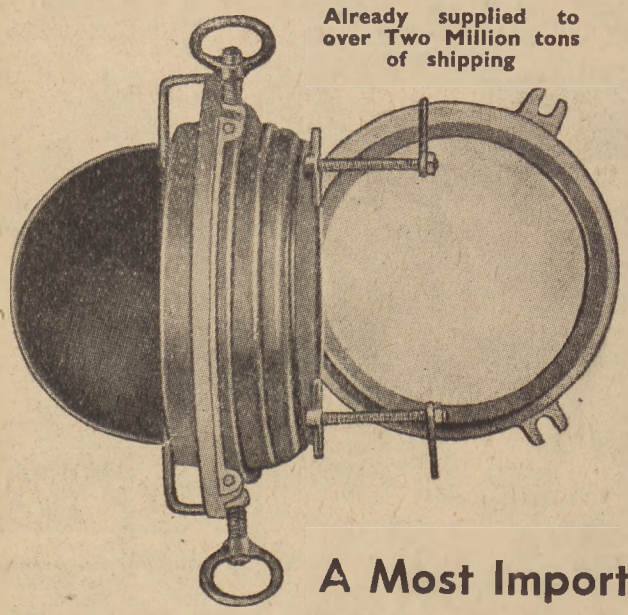

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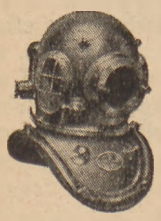

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possessions. Australia lay ripe for the picking and the United States had lost command of the Pacific. But 1942, which opened with disaster, proved a period of recuperation during which the United Nations were able to gather their strength and inflict a series of defeats upon the enemy.

As to our own particular part in the war at sea, the Royal Navy's principal task has been chiefly confined to keeping clear the ocean lines of communication and protecting our merchant ships as they went to and fro upon their lawful occasions; convoying the ships taking supplies and munitions to Russia and to Malta; and safely conducting reinforcements—troops and their equipment—to our armies in the Middle East.

The fight against the U-boat has proceeded with fluctuating fortunes. It is a battle which inevitably must have its ups and downs. The enemy has experienced successful periods when sinkings of merchant ships have been heavy; but there have been other occasions when these have been light and our naval forces have inflicted great losses upon the enemy's U-boats.

In that long period when Britain stood alone, the enemy marshalled his submarines and long-range aircraft for the attack. Then our losses were grievous. It took some time to build up a fleet of corvettes and escort ships adequate in numbers for the task they had to perform and to supply our merchant ships with defensive equipment against the Focke-Wulf and other aircraft which were used specially for attacking shipping; but, in course of time, the enemy submarines were driven farther and farther away from our shores, and the strength of our escorts was such that air attack on Atlantic convoys and even on shipping using the North Sea proved too costly for the enemy.

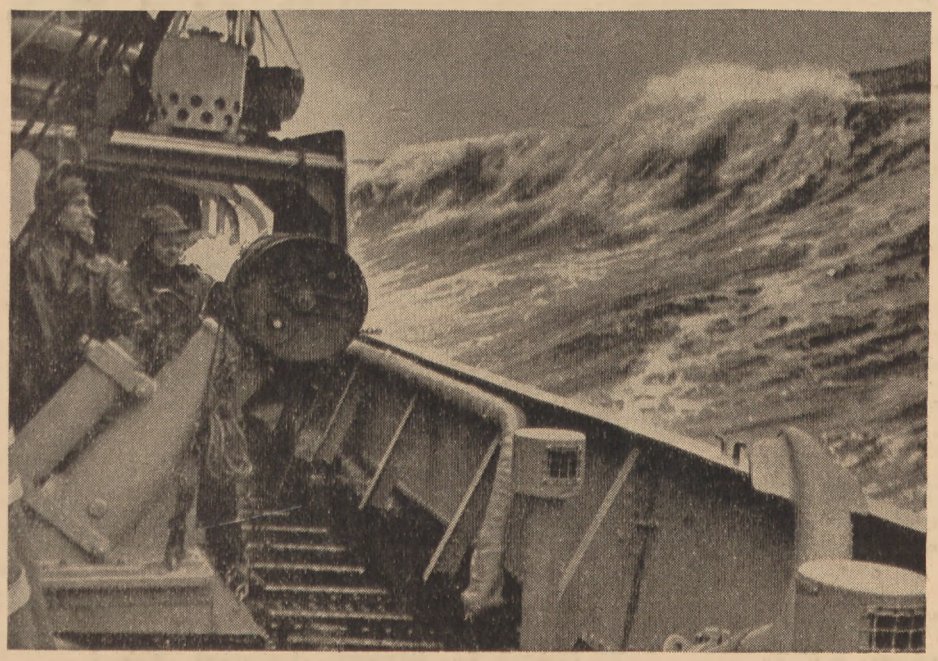
More than 15,000 men like these have given their lives in maintaining our sea lanes

However, when certain areas are made too dangerous for the enemy's submarines they seek the "soft spots" farther afield and, when the United States came into the war, the eastern coast of America and the Caribbean Sea proved a happy hunting ground for the U-boats, for it took time for the United States, as it did Britain, to inaugurate a protective and convoying system which would give comparative safety to her shipping. During the first six months of 1942, the American merchant fleet suffered heavy losses, particularly in tankers carrying oil from the Gulf of Mexico to North American ports.

It was the policy of the German High Command to endeavour to get in very heavy blows before the United States could be fully mobilised for war and for the protection of her shipping. The weight of attack in American eastern waters was great. The Germans even claimed that the U-boat war had been carried "right to the waters off New York." They made other claims, and it was asserted that in six months since January 24 no fewer than 616 merchant ships had been sunk in American waters and that the Allied tanker fleet had lost 163 vessels during that period.

So weak was the defence against the U-boats that some ships were sunk and set on fire by gunfire from the submarines. It would, of course, have been impossible to sink ships by gunfire if they had been in convoy, although there have been several instances of British defensively-armed merchant ships driving off submarine attack and even inflicting damage upon them; but the submarine has had a great advantage against unconvoyed and unprotected ships because of her more powerful armament and higher surface speed.

For a time the losses of merchant ships suffered by the United Nations were in excess of new tonnage being



Preparations on board a Norwegian warship for depth-charging an enemy submarine.

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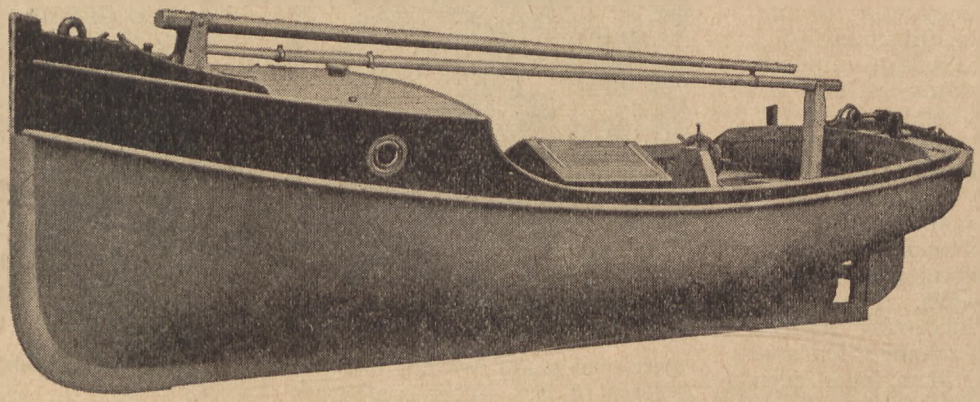

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built in the shipyards of Britain and the United States; but, as losses decreased and American shipbuilding got into its stride, the position was reversed in the latter half of the year, and practically ever since June, 1942, new buildings have been in excess of sinkings, despite the exaggerated claims made by the enemy.

It must, however, take some little time before the losses which have been suffered since the beginning of the war are fully made good and a reserve of shipping created for use in furthering military operations all over the world as and when necessary. Nevertheless, it must have been as great a surprise to the enemy as it was to many people in Britain and America when a fleet of some 500 merchant ships was got together to transport the Allied armies and their weapons, stores and equipment to North Africa.

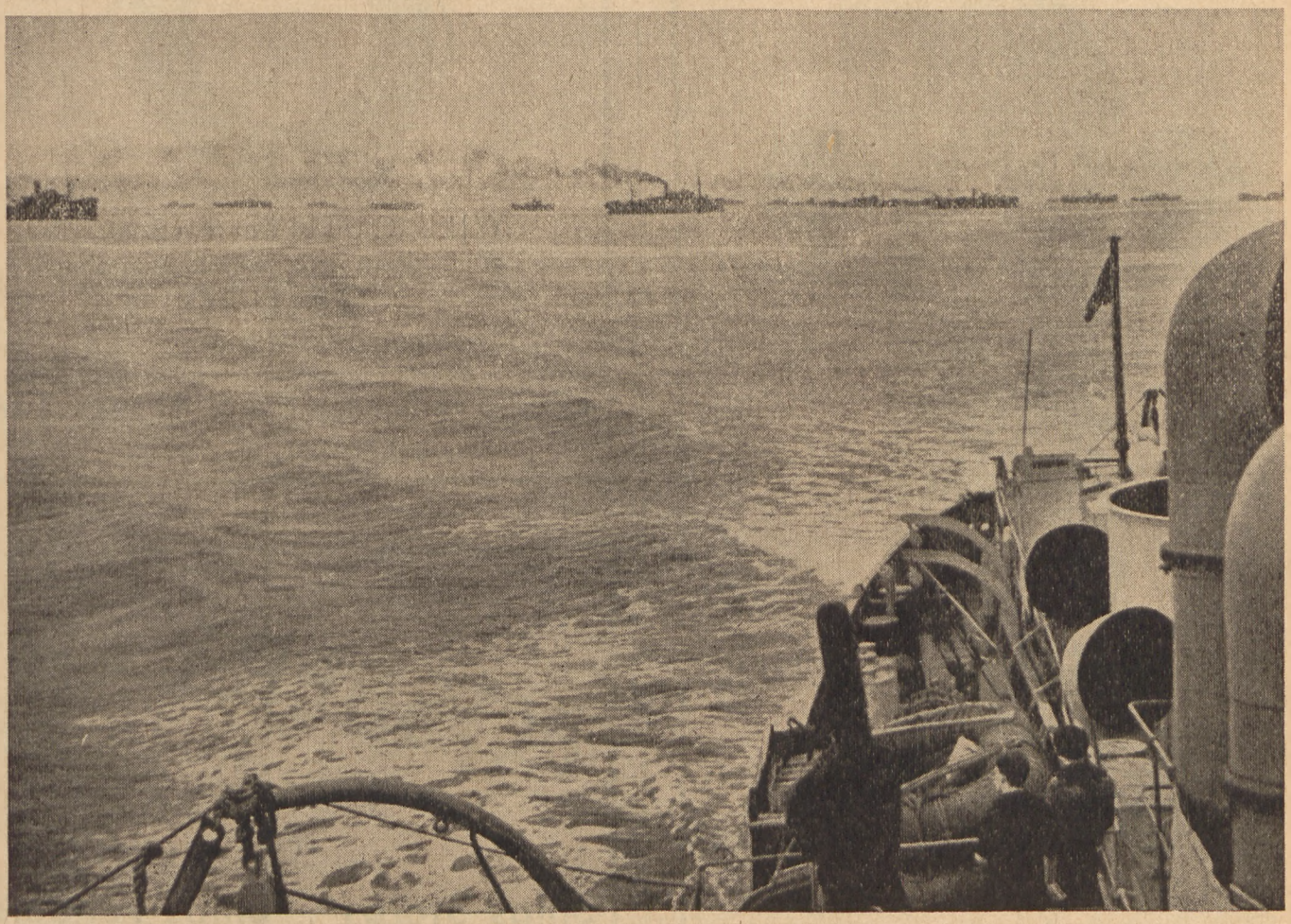
When at last American escort forces had been strengthened and few American ships were sailing unconvoyed, the U-boats turned to other areas. The wolf-pack system was resumed against our Atlantic convoys. The submarine crews had regained a certain amount of confidence as a result of their easy victories off the American coast, and the Battle of the Atlantic was renewed with greater intensity. We incurred losses and, in fact, losses are unavoidable even to-day; but the enemy pays dearly for any successes he may achieve.

The enemy knows and has admitted that convoys bound for England are "strongly defended by destroyers, escort vessels and aeroplanes," that in various cases "the U-boats are driven away, forced under the surface, and effectively attacked with depth charges." However, in spite of the obstacles and the losses of submarines, the attacks on shipping persist and will continue to the end, for the enemy knows that his only hope of victory lies in the success of his submarine arm.

He is largely confining his programme of naval construction to the building of U-boats; and the fact is beyond dispute that enemy submarines increase in number faster than we can destroy them. This means that our escorting and hunting craft must increase still faster to deal with these greater numbers. But the enemy's submarines cannot operate without bases and fully-trained crews. It is true that Germany has been in occupation of the French western coast for two-and-a-half years, and this has provided her with many bases from which her U-boats can operate; but we are gradually occupying other places which might have been used as submarine bases, such as ports of Northern and Western Africa and the island of Madagascar.

The great port of Dakar, for example, which it was feared at one time might be used by the enemy, can now never be utilised as a base for submarines operating against shipping going to the Middle East and returning round the Cape.

Nevertheless, the German submarines can operate at great distances from home bases. The crews undoubtedly live in discomfort for much of their accommodation is used for the carriage of additional supplies of fuel to enable them to keep at sea for longer periods. One German newspaper went so far as to claim that German submarines were operating 6,000 miles from bases, adding that "the radius of U-boats to-day surpasses all imagination." When the normal hunting



Merchant ships moving into position prior to the departure of a trans-Atlantic convoy.

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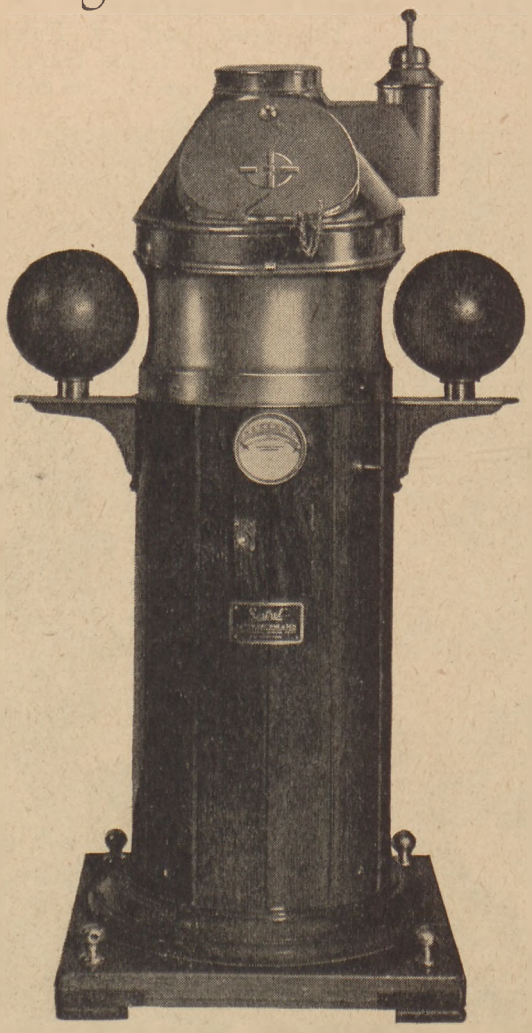

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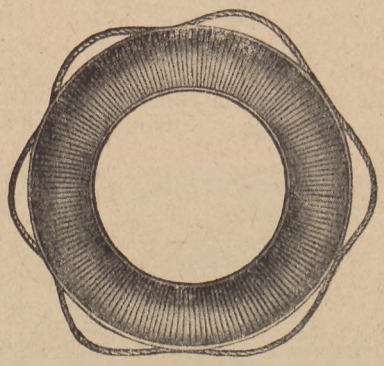

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grounds in the North Atlantic and the waters of the United States became too well protected, some of the enemy's submarines were concentrated on the Cape route to Persia, by which supplies are sent to Egypt, Russia and India. Some British ships were sunk in an area off the Cape of Good Hope towards the end of September.

For many months previously enemy submarines had been operating off Freetown, but this new area off the Cape was distinct from the Freetown operations. Possibly as a result of the denial of North African ports to the enemy and our use of them—or, it may be, because of additional protection given to our shipping round the Cape —there have been fewer attacks by submarines in this area. No doubt one of the objects of the German High Command, apart from the attempt to destroy shipping in that area, was to tempt us to disperse our anti-submarine forces, after which the U-boats could switch back to waters nearer home.

It might also, of course, have indicated the disinclination of the enemy to risk his submarines in attacks on strongly-escorted convoys. None the less, in view of the difficulties of refuelling which would seem to be necessitated by operating so far away from their home ports, the switching over to the Cape area was something of an achievement, although it was believed that an organisation of some kind must have existed which would have given the submarines opportunities for refuelling and taking in supplies.

Shipping is the key to the door through which our armies can march to victory. Without an adequate supply of ships and the means to protect them American and British armies and their equipment would be confined to their own countries. Mr. Herbert Morrison has told us that 80 per cent. of the war production of Britain is shipped overseas and so also is every man for whom shipping space can be found. But the transport of four-fifths of our war output is only a part of the story.

There is also the transport to our shores of a great part of America's war production and the food supplies which our Ally sends us. Those great and innumerable cargoes are convoyed across the seas by the ships of the Royal Navy. When we remember that our losses of convoyed ships amounts to only one-half of one per cent., we can perhaps realise how successful the Navy is performing its task.

As Mr. Morrison has said, figures tell little of the real truth behind the exercise of sea power, but here are some which convey something of the Navy's daily task. It regularly patrols over 80,000 miles of trade routes—three-and-a-half times round the world. It keeps guard constantly over the two to three thousand British and Allied merchant ships which are always at sea. It sweeps mines from over 14,000 miles of sea lanes. Its warships and the aircraft of the Fleet and R.A.F. have escorted over 120,000 voyages in convoy. It has at sea constantly 600 warships and auxiliaries, some of which have travelled a distance equal to nine times round the world. It has swept enemy shipping from the High Seas and destroyed, captured or damaged 125 of his warships and over six million tons of his shipping.

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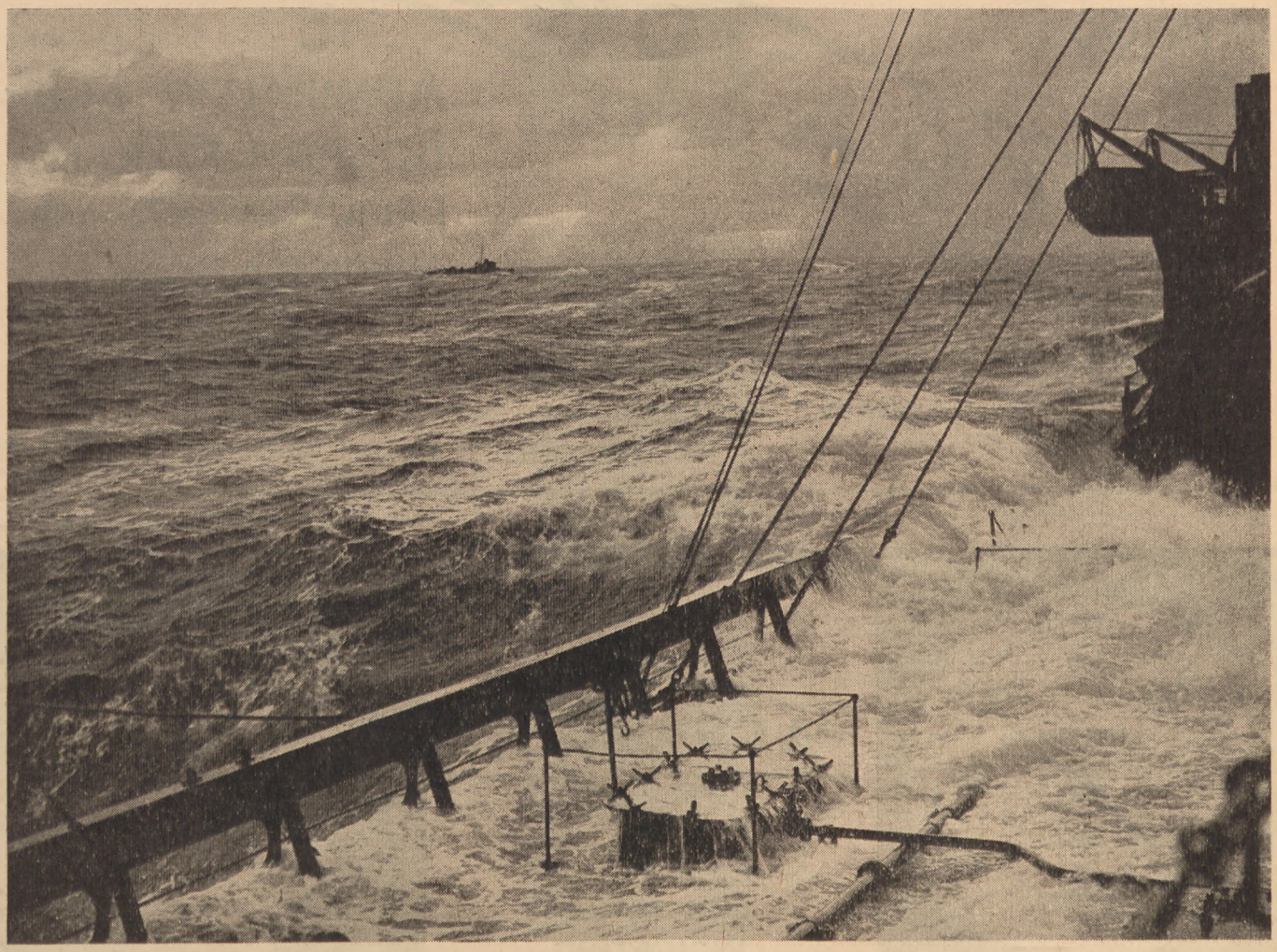

Seas breaking over the deck of a tanker loaded with oil for this country. An escorting warship is also seen.

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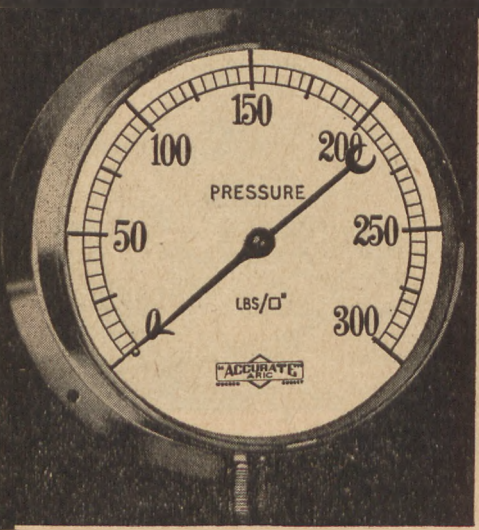

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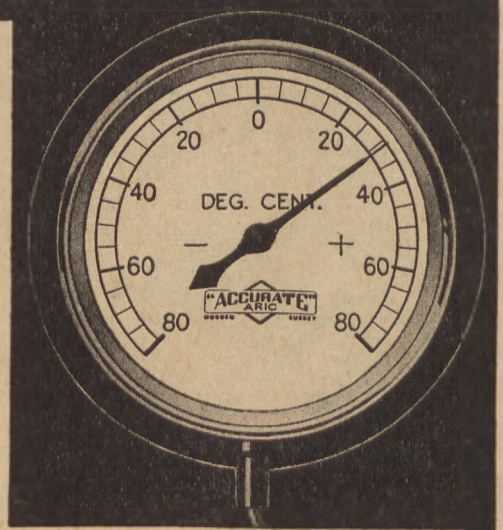

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heaviest when operating in narrow waters, where our ships have had to pass within attacking distance of enemy shore-based aircraft and where it has not been possible to give our ships fighter protection against the attackers. Our convoys to Russia have to pass within range of German aircraft based in Norway. Latterly a certain amount of fighter protection has been given to our ships for our escorting warships have generally included aircraft-carriers, from the decks of which fast new fighting aircraft can be sent off to battle with the high-level and dive-bombing aircraft of the enemy.

Previous to the occupation of Northern Africa in the west and the advance of General Montgomery's army in the east, our convoys to Malta also had to run the gauntlet, practically all the way through the Mediterranean, of the enemy's land-based aircraft for, before the rout of Rommel, we had few aerodromes or advance landing grounds, and the enemy was in occupation of the entire northern coast.

It may be asked why British shipping in the coastal trade can proceed along the Channel and up and down the East Coast of England in comparative freedom, despite the fact that all the aerodromes on the other side of the North Sea and the Channel are in enemy hands, and, in addition, fleets of E-boats (fast motor gunboats) are based on French, Dutch and Belgian harbours. But around the coasts of Britain we have air superiority. Our aircraft are continually patrolling the skies, and there are few German airmen who would be so foolhardy as to risk an attack on our well-protected coastal convoys.

It was, of course, not always so, and when we were building up our strength in the air and at sea, the enemy made that narrow strip of water between the Norfolk and Suffolk coast and Holland ("E-boat alley" as it was called) a very dangerous area. Now, however, our coastal forces have taken the war into the enemy's camp. We are no longer on the defensive around our coasts. It is the enemy's convoys which are attacked in their own waters.

The larger units of the Royal Navy have had little opportunity of showing their qualities during the past year against the enemy; but since the main duty of the fleet is to keep the seas open for our shipping and deny their use to the enemy, it matters little whether this has been accomplished by destroying the enemy's warships or keeping them confined to their bases. The safe conduct over thousands of miles of ocean of the expeditionary force to French North and West Africa in November was a striking demonstration of the value of sea power.

Many Merchant Navy captains and officers have received awards for gallantry and good seamanship: the three whose portraits appear below received high recognition for their services in taking war material to Russia and Malta.

Capt. W. H. C. Lawrence, C.B.E.

Capt. R. D. Macfarlane, D.S.O.

Capt. F. N. Riley, D.S.O.

One of the objects of this combined operation was to clear the enemy out of North Africa and to endeavour to ensure a more or less free sea route through the Mediterranean. This, of course, would ease the strain upon our shipping resources considerably for, previous to this occupation and the advance of the Eighth Army in pursuit of Rommel's forces along the road to Tripoli, we were unable to give air protection to our shipping using the western basin of the Mediterranean. The voyage of each convoy to Malta was in the nature of a major naval operation.

While the enemy occupies the northern shores of the Mediterranean, he will, of course, still be in a position to harass our shipping using that sea, but we shall be in possession of many large aircraft bases which will enable our fighters to intercept such attacks.

With the French Fleet immobilised the Italian Navy remains the only danger in the Mediterranean apart from enemy aeroplanes and submarines, which have been assembled in great strength. The British Fleets based in the eastern and western basins of the Mediterranean should, however, prove more than a match for any surface fleet which might be brought against them.

It is essential, of course, that an adequate fleet shall be based in home waters in readiness to deal with the German warships, from the *Tirpitz* downwards, based on Norwegian ports. There is always the danger that these ships may attempt to get out on to the ocean routes to prey upon our shipping—although the fate of the *Bismarck* has no doubt proved a deterrent—and to interfere with our convoys to Russia.

The major actions at sea have taken place principally in the Pacific, where American surface ships have borne the brunt of the fighting. As to what has been accomplished one could not, perhaps, do better than quote Admiral Chester W. Nimitz, Commander-in-Chief of the U.S. Pacific Fleet. During the first year in the Pacific, he said, the American Fleet had completed three major tasks.

First, the sea-lanes across the greatest of oceans had been made safe for the movement of an increasing flow of men and materials to the fighting fronts. Second, American task forces, assisted by the army, have not only repulsed all major enemy thrusts —notably in the Coral Sea, at Midway and in the Solomons—but have progressively carried on a war of attrition, steadily whittling down the enemy's superior sea and air power. Thirdly, most of the ships damaged at Pearl Harbour are on their way back to the fleet, better fighting ships than ever, and Hawaii has been greatly strengthened.

Referring to the Coral Sea, Midway and Solomons battles, Admiral Nimitz said that each of these actions had had an increasing importance. As their strength had gradually been developed the United States had been able to extend themselves more and more. That process is still going on.

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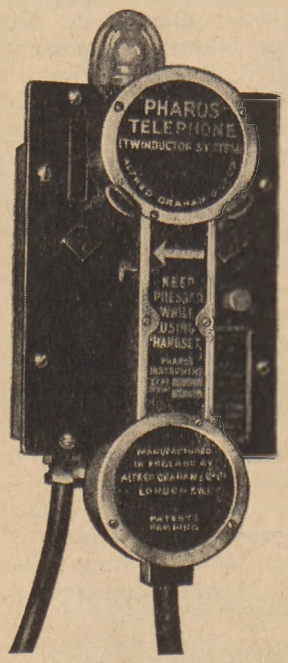

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The surface ships have been in all actions from the very start. At first the battles were duels between aircraft-carriers, but surface ships were there, guarding the carriers and destroying planes with their gunfire. From now on, as Japanese carrier strength becomes depleted, we may expect more and more surface actions such as have taken place in the Solomons.

America has made a marvellously quick recovery since the attack on Pearl Harbour. In the official report on this attack, it was stated that the Japanese aircraft temporarily disabled every battleship and most of the aircraft in the Hawaiian area. Other naval vessels, both combat and auxiliary, were put out of action and certain shore facilities, especially at the Army air bases, the Hickam and Wheeler Fields, and the Navy air stations at Ford Island and Kaneohe Bay, were damaged. Most of these ships are now back with the fleet. The aircraft were all replaced within a few days and interference with the facilities was generally limited to a matter of hours.

Pearl Harbour was a staggering blow, but it awakened the United States to the tremendous task which had to be accomplished before victory could be won. As in Great Britain, the people of America are determined to make every sacrifice that may be necessary to produce the weapons and ships of war and commerce which will be needed to ensure that freedom and liberty shall not perish from the earth.

The full significance of the statement made by the First Lord of the Admiralty when the war had been in progress for about three years, that practically all our losses in warships had been made good, an entirely new fleet of corvettes constructed, as well as many special types of ships such as landing craft, put into service, has not, perhaps, been realised by the general public. Our losses in fighting ships have been fairly heavy. When we remember that not only have they been made good, but millions of tons of new merchant ships have been completed and placed into service, as well as repairs on a scale far more extensive than was experienced in the last war, we perhaps get some idea of the debt which is owed to the private shipbuilding industry of this country.

It is admitted, of course, that the Royal Dockyards are also responsible for the construction and repair of ships of war, but the greater proportion of the ships of the British fighting Navy have been constructed in the private establishments which have, over the course of years, built up their facilities and trained their staffs for the purpose. The dockyards have not turned out a battleship or a battle-cruiser since 1916, when Portsmouth built the *Royal Sovereign* and Devonport the *Royal Oak*. The former's machinery was supplied by the Parsons Marine Steam Turbine Co., Ltd., and the latter's by Messrs. R. and W. Hawthorn Leslie and Co., Ltd., the boilers were supplied by Messrs. Babcock and Wilcox, Ltd., and Yarrow and Co., Ltd., respectively.

In 1915 Portsmouth had completed the *Queen Elizabeth* and Devonport the *Warspite*, but the machinery for both ships was supplied by private firms, the *Queen Elizabeth's* by the Wallsend Slipway and Engineering Co., Ltd., and the *Warspite's* by Messrs. Hawthorn Leslie. The boilers were again supplied by Messrs. Babcock and Wilcox, and Yarrow respectively.

All the fighting ships of the *King George V.* class, battleships of 35,000 tons displacement, were built in private yards, the *King George V.* by Messrs. Vickers-Armstrongs Ltd. on the Tyne, the *Prince of Wales* by Messrs. Cammell Laird and Co., Ltd., the *Duke of York* by Messrs. John Brown and Co., Ltd., the *Anson* by Messrs. Swan, Hunter and Wigham Richardson, Ltd., and the *Howe* by the Fairfield Shipbuilding and Engineering Co., Ltd. The machinery for all, except the *Anson*, was supplied by the shipbuilders. That of the *Anson* was supplied by the Wallsend Slipway and Engineering Co., Ltd.

It was good for the nation that when the war clouds began to gather over Europe, the private warship building establishments had kept their plant in readiness for the service of the country should the emergency arise, this in spite of the fact that they had received little encouragement to do so. During the period of appeasement, which lasted for between 10 to 12 years, the private yards were starved of orders for naval work.

The position during those disastrous years was concisely pictured in an article by an authoritative writer contributed under the nom-de-plume of "Sentinel" to "Brassey's Naval and Shipping Annual" some time ago. In it particulars were given of the warship building resources which were available in Britain in private establishments. The writer pointed out that, in ordinary times, it frequently happened that when Admiralty work was scarce orders for merchant work were sufficiently numerous to enable warship builders to turn their men over to merchant work and to employ essential labour—which would be required for warship work later—on large passenger ships, for the construction of which they were specially equipped. But the curtailment of warship building unfortunately synchronised with a period during which there was very little building or replacement of large passenger liners. The result was that over 100,000 workers left the industry — the majority never to return. That is a position against which we must endeavour to safeguard ourselves in the future, after the present war has been brought to a successful conclusion.

The British shipbuilding industry played an extremely important part in the war of 1914-1918, and no less notable are its achievements in the present war with a personnel much reduced in numbers.

Before leaving the subject of naval construction, tribute should be paid to the assistance which has been received from Canadian yards in helping to provide additional escorts for convoying merchant ships. When the war started, Canada had a very small Navy. Probably by the time this article appears the personnel of the Royal Canadian Navy, officers and men, will have increased to well over 50,000 and the Navy itself to over 550 ships.

The vessels which make up the Royal Canadian Navy, except some destroyers acquired elsewhere, have been built in Canadian yards, and there is still a large programme of escort ships under construction for the Canadian Navy and for the Royal Navy. In addition, Canadian shipyards have been turning out merchant ships at the rate of one 10,000-tonner every three days. They are also building 5,000-ton ships and their output for last year has been estimated at over 1,000,000 tons deadweight. If steel supplies are forthcoming it is probable that this year Canadian yards will be able to improve on last year's output by 30 per cent.

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MARINE INSURANCE SURVEY

By DOUGLAS KING-PAGE

A YEAR ago it was possible when commenting on marine insurance happenings in 1941 to revert to the normal plan of dealing with hull business, cargo business and war risks in that order, but on this occasion the developments of the past 12 months have made it necessary to deal with the war situation if not with war risk business first, because these developments have had so profound an effect on both marine and war risk insurance.

A year ago it was only possible to make what amounted to a passing reference to the extension of the war to the Western Hemisphere. Japan's attack upon America was then very recent, and all that could be said was that until America's entry into the war the course of war risk insurance rating had been comparatively uneventful. Then, in fact, the event was so recent that it could not be seen in perspective nor could its influence upon business in general be foreseen with any degree of accuracy.

We now know that, among other things, war in the new battle zone necessitated the extension of the scope of the "surcharge" system to what amounts to practically the whole world. This was effected in January, when the "surcharge" schedules were revised.

These schedules, which embody the scales of rates which are superimposed on the basic cargo rates to meet the added maritime perils of navigation in time of war, had, up to Schedule No. 9, dated January, 1942, excluded voyages to, from or within the Western Hemisphere, which was defined as "North America, Central America, South America, Hawaiian Islands, Newfoundland, West Indies, Bermuda and Bahama Islands." In Schedule No. 10, dated February 10, 1942, this wholesale exclusion had disappeared, and the application of the surcharge system became world-wide.

Thus, by what amounted to a stroke of the pen, a profound change was effected in the whole basis of the rating of marine risks. Primarily that change meant that a very considerable bulk of business which had previously been free of surcharge became subject to surcharge, and this meant a very appreciable increase in the flow of premiums into the market. Against this the waters which had previously been free of surcharge had, by the expansion of the zone of hostilities, become more dangerous in varying degrees than when America was not at war, Japan had only the China war on her hands, and Australasia was so remote from the European war and so little involved in the Sino-Japanese affair that the perils of navigation in the waters around the coasts of these countries were practically normal. To balance the increase in premium against the increase in perils is impossible, but it is of interest to study the rating of the different zones.

The main zone is that which, in the schedule dated July, 1942 (No. 12), embraces the United Kingdom, the Continent between North Russia and Gibraltar inclusive, the Azores, Madeira, Canary Islands, Cape Verde, Greenland, Iceland, and, for the first time, "Black Sea and/or Mediterranean and/or adjacent waters, Red Sea, Gulf of Aden and Persian Gulf."

This last item had previously been in a lower rated category, but in Schedule 12 it appeared under the highest scale of rates, which was, for the first time in schedule history, expressed in fractions and not in shillings and pence. For the basic surcharge, which is for "with average only or less comprehensive conditions, also insurances on gold, silver, papers of value, &c.," the rate is ½ per cent. Then for "with average or more limited conditions, but including theft, pilferage, non-delivery, short delivery, short weight and shortage," the surcharge rate is ⅝ per cent., while this rate also applies to "fuller conditions than Section 1, but excluding theft, pilferage, &c." The third category is for fuller conditions than either of the first two, i.e., for something more than with average, theft, pilferage, &c., and here the rate is ¾ per cent. These rates are the same as in the previous schedule, but, being in fractions, are better understood in countries and by peoples whose currencies are on the decimal system.

This fractional system of rating persists throughout the whole schedule, but the differentiation in rating for policy conditions of varying degrees of comprehensiveness does not, the rate being the same for all classes of policy conditions in some of the minor items applying to short voyages.

Schedule No. 12 also includes a section for the Western Hemisphere as a whole with certain specific exceptions, such as voyages within the Caribbean and Gulf of Mexico, South American coastwise voyages, &c.

So far as the system itself is concerned, it only remains to be added that it has proved the proper solution of a problem arising simply and solely out of war conditions. It has its dangers, chief amongst these being the possibility that underwriters will forget that sooner or later surcharges must cease, and they will then be dependent upon the basic rate alone for their premium income.

It may be that in the course of time surcharges, in whatever form they may ultimately reach, will become merged in the basic rates, and the business will be placed upon an entirely new and unified basis of rating. Obviously, when hostilities cease, the added perils of war-time navigation will diminish, but they will not disappear altogether, for some time after the last shot has been fired, the last mine laid, and the last extinguished coastal light relit.

It is reasonable to suppose as risks improve, so will surcharge rates be modified, but it is obvious that underwriters will not be able to dispense with them altogether immediately war is over, and the most reasonable course to adopt would seem to be a merging of the existing surcharge rates into the basic rate, thus forming a new system of basic rating to operate by itself.

Perhaps the most surprising feature of the entry of America into the ranks of the United Nations—so far as marine insurance was concerned—was the unpreparedness of the American market for what actually happened.

The U.S. market had created its war risk reinsurance exchange, the Government had encouraged the development of the war risk hull syndicate and had set up its own machinery for insuring war risks. All interests in America had had the opportunity of studying the effect of active hostilities at sea upon the business of marine insurance. We, in this country, had seen war becoming more and more a certainty on the other side of the Atlantic, and yet, when the blow fell, it found

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the American, but not the British market, inadequately prepared against eventualities which, to us on this side, had seemed inevitable.

The true situation in the United States was revealed by Mr. H. H. Reed, of the Insurance Co. of North America, who, in a paper read before the U.S. Bar Association, stated that the first American war risk insurance legislation, enacted while America was not at war, was hedged around by restrictions owing to the strong isolationist sentiment of the period so that very little war risk insurance was effected with the Government.

When the attack on Pearl Harbour jolted America out of isolationism, "almost everybody in the United States was shocked and surprised by the vicious submarine attacks and the widespread destruction they were able to accomplish on this side of the Atlantic." These are Mr. Reed's own words, and it must be incomprehensible to any who followed the course of events in the war at sea that anyone, much less almost everybody, in America should have been surprised by either the viciousness of the attacks or the measure of success they achieved. American underwriters had had ample opportunity of observing the measure of success enemy submarines could obtain against the tonnage of other nations, and there was no reason to suppose that American tonnage would be specially immune from attack once America had become a belligerent. Be that as it may, Mr. Reed had to record:—

"The cost to underwriters had been substantial. With respect to hulls, the syndicates insured these hulls prior to the passage of the second War Risks Insurance Bill and made available to shipowners a market up to $4,000,000 when there was no adequate Government market available. Unfortunately they underestimated the capacity of the Axis to successfully attack off our shores with the result that the hull business had cost many millions of dollars in excess of the premium."

The same shock was felt with regard to cargo business where, of course, the reinsurance exchange operated to spread the risk over the whole market, but it is extraordinary that this should have been the case with regard to either hulls or cargo.

English underwriters had, it is true, the mutual war risk associations to absorb hull business and the cargo "pool" with its Government insurance against King's enemy risks to help them over the shock period losses of the outbreak of war in 1939, but America had the advantage of seeing just what happened to British tonnage at the outbreak of war, and it is astounding that neither the Government nor underwriters had sufficient foresight to provide against the eventualities of war in which America was a belligerent.

American underwriters were, in fact, in a better position than English underwriters to build up a reserve of war risk premiums against eventual shock period losses, for they had enjoyed the fruits of non-belligerency for two years of war during which their tonnage and cargo losses had been comparatively light, while the war risk rates of the American market had been kept very much in line with those of London.

Mr. Reed also criticised the Government's policy of war risk insurance after Pearl Harbour, particularly in so far as the charging of token premiums on imports was concerned, saying that this amounted to a subsidy. He advocated that the Government should charge a rate reasonably representative of the risk and maintain that rate on a stabilised basis so that fluctuations in commodity prices might be reduced to a minimum.

As for war risk business in the English market during the past year, the schedule dated January 30 was No. 43 and that dated December 9 was No. 58, so that there have been 15 revisions up to that date, which argues considerable changes in the situation. Naturally, Far Eastern rates have risen to a considerable extent, but perhaps the most striking change has been the disappearance of the differential rating of Eire in the United Kingdom section where previously Eire had been rated at double the U.K. rate, except for Dublin voyages, subject to certain conditions as to route and a warranty of convoy.

War risk rates in general increased considerably during the year. Take the North, Central and South America rate for West Africa, which in January was 60s per cent., and in December 12½ per cent. Australia to the East was rated at from 4 to 7½ per cent. in January, but in December the Eastern rates were from 10 to 12½ per cent. India, east and north of Colombo to Africa south of the Equator not west of Capetown, including Islands was rated at £4 per cent. in No. 43, but in No. 58 the rate for India east of Cape Comorin not east of and including Chittagong to East Africa, south of British East Africa and South Africa not north of Capetown on the West Coast was 12½ per cent.

These changes reflect the changed situation in the war at sea, but obviously cargo war risk rating is likely to be affected, perhaps very materially, by the invasion of North Africa by the United Nations, although at the time of writing that event is still too recent to have had any pronounced effect. The defeat of Rommel's Army has, however, resulted in some downward modification of the war risk rates for voyages to and from the Eastern Mediterranean and adjacent waters.

As yet this downward trend has not affected the rates of the Government War Risk Insurance Office but in a new schedule dated November 18, dealing with "overseas" voyages only, some upward readjustment of rates for voyages impinging on the West Coast of Africa is noticeable. Here, again, it may be that events in North Africa will have a modifying effect.

Two incidents concerning the Government War Risk Office which occurred during the year must be recorded. The first was in June, when it was announced that the "overseas" schedule, which had previously applied only to cargo on cross-voyages in British ships only, would be available for interest in Allied and neutral as well as in British ships. This created some apprehension in the open market, where it was feared the extension of the Government scheme would deprive underwriters of nearly all the cargo business which remained available to them in view of the fact that the Government enjoys a virtual monopoly of all United Kingdom war risk business.

Strong representations were made by representatives of the open market, however, and it transpired that it was not the intention to deprive underwriters of any business for which facilities were adequate, and that only where special circumstances required would the Government War Risk Insurance Office accept business which had previously been placed in the open market.

The other incident occurred in August when, as a result of some difficulty which brokers had experienced in gaining access to a member of the committee of management, a misunderstanding arose as to the right of brokers to consult members of the committee directly. One broker in a letter to *The Journal of Commerce and Shipping Telegraph* asserted that he had been informed that brokers had no such right, and it appears that something of this nature was in fact said by an official of the Government War Risks Insurance Office.

Ventilation of the matter by means of the broker's letter soon brought about a better understanding, however, and the incident undoubtedly cleared

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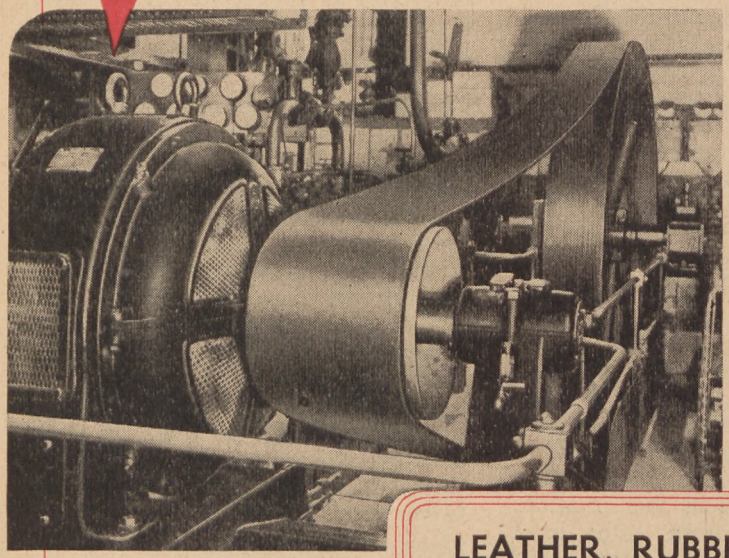

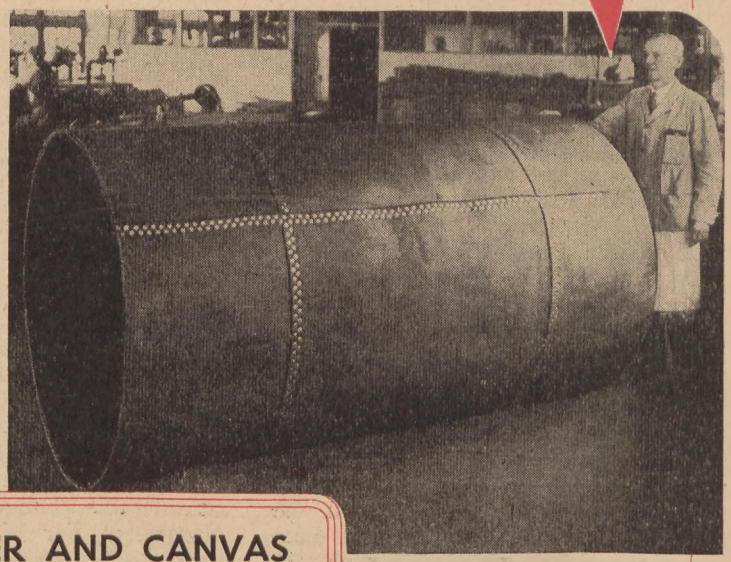

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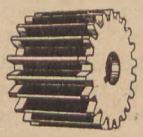

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the atmosphere. It would hardly be worth recording but for the fact that it has an important bearing upon the necessity for close collaboration between the open market and the Government Office, a collaboration that has been achieved by goodwill on both sides, of which the happy outcome of a slight misunderstanding is evidence.

Interest in war risk business has largely centred on technical developments and the most important event in this connection was undoubtedly the revision of the F.C. & S. Clauses in the light of the Coxwold case.

That case, which will probably prove the outstanding legal dispute of this war, turned on the question of whether a claim should fall on the war or the marine insurers. The vessel stranded when bound for Narvik with petrol for the troops. She had lost touch with her convoy, visibility was bad and there was no negligence in her navigation. Among other factors in the case were a suspected enemy submarine and an unknown and undetected tidal current which undoubtedly set her towards the shore on which she stranded.

An arbitrator found, subject to certain legal rulings, that the vessel had been damaged by a war peril. In the King's Bench Division this decision was upheld and despite a very emphatic reversal in the Court of Appeal, the House of Lords confirmed the finding that the casualty was a consequence of hostilities. The judgment was almost, though not quite, to the effect that if a vessel is damaged by a patently marine peril whilst engaged on a warlike adventure the casualty is a war casualty because the vessel was engaged on a warlike adventure.

This created a precedent so foreign to the general conception of the situation with regard to war and marine casualties that the Ministry of War Transport, shipowners and underwriters collaborated with a view to adopting a clause which would create a legal situation more in accordance with the desires and requirements of all concerned.

Obviously this could best be done by a revision of the F.C. & S. Clause not only because that clause excluded war losses from the marine policy but also because its wording was the basis of the War Clauses, under which war risks are customarily covered. Equally obviously both the F.C. & S. and the War Clauses had to complement each other so that the risks excluded from the marine policy as war risks by the F.C. & S. Clause were covered under the war risk policy embodying the War Clauses.

The first attempt at revision was never made public, but it was very long, very cumbersome and open to serious criticism. About the same time a version of a clause to be added to the F.C. & S. Clause was put forward from obviously authoritative quarters as a suggested remedy to the difficulty with which the Coxwold case had confronted underwriters.

This suggested clause was to the effect that in deciding whether a claim should attach to the war or the marine policies, no account should be taken of the nature of the voyage or service of the vessel concerned. In the case of hull risks, this would mean the insured vessel, and in the case of cargo it would mean the carrying vessel. Despite the apparent soundness of the principle underlying this suggested clause, the one eventually adopted was far more complicated and was severely criticised both in its initial draft and in its final form.

The new clause was announced by the Ministry of War Transport on November 6, and this emphasised that it did not emanate from the Technical and Clauses Committee or from any marine insurance market organisation. It took the form of an interpolation into the current Free of Capture and Seizure Clause, coming immediately after the provisions with regard to war risks and separating those provisions from the paragraph dealing with Civil War, Rebellion, Insurrection, &c. The actual interpolation reads :—

"But this warranty shall not exclude collision, contact with any fixed or floating object (other than a mine or torpedo), stranding, heavy weather or fire, unless caused directly (and independently of the nature of the voyage or service which the vessel concerned, or, in the case of a collision, any other vessel involved therein, is performing) by a hostile act by or against a belligerent Power; and for the purpose of this warranty 'Power' includes any authority maintaining military, naval or air forces in association with a Power."

This interpolation has necessitated a slight variation of wording to bring in civil war, &c., the concluding paragraph reading "Further warranted free from the consequences of civil war, revolution, rebellion, insurrection or civil strife arising therefrom, or piracy."

This last paragraph is punctuated differently from the equivalent wording of the old text where, by omitting commas, the intention was to make it clear that "civil strife arising therefrom" applied to "revolution, rebellion and insurrection." Whether the insertion of commas in the next text makes civil strife apply only to insurrection seems a question for the law to decide.

Having been adopted, it became necessary to arrange that the new clause should come into operation in a manner that would not leave any risk with the old and new clauses conflicting in their respective policies. The principle adopted was that the war risk insurance governed the situation. If the war risk policy had the old War Clauses, then the marine policy had to have the old F.C. & S. Clause, but if the war policy had the new War Clause, then the marine policy had to embody the new F.C. & S. Clause. November 21 was the date fixed for the change-over for hull risks, and the Joint Hull Committee issued an announcement, the effect of which was that all marine hull risks current on that date should be deemed to embody the new F.C. & S. Clause in substitution for the old when the current war risk insurance expired and was renewed with the new War Clause.

As for new business, the ruling was that where the war risk insurance contained the new clause and the marine contracts had not previously attached, the marine contract would be issued with the new F.C. & S. Clause. This overcame the difficulty which otherwise would have arisen in the case of new marine risks attaching when the current contracts had still time to run. If, in such cases, the new marine risk had been made to attach with the new F.C. & S. Clause, the war insurance would have been subject to the old clause and the marine risk to the new clause.

Both with regard to current and new marine risks embodying the old F.C. & S. Clause, the question of the legality of substituting the new clause for the old during the currency of a policy was raised. Primarily this was an academic point because no shipowner would have been so ill-advised as to combat a variation of his contract so obviously to his advantage. Nevertheless, the fact that a change of policy conditions was being effected without the express consent of both parties to the contract was regarded in some quarters as a dangerous precedent, and "The Times," on this point, remarked that: "It is possible that in other times other methods might have been chosen for effecting the alteration in terms."

As for the application of the new F.C. & S. Clause to cargo business, no official announcement has been made at the time of writing, but there is a very general impression that so far as open cover business is con-

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cerned, notice of cancellation will be given and the risks re-instated with the new clause on the expiry of the period of notice.

The Hull Market

In the hull market the situation seems to be more obscure than ever. At the beginning of 1942 the Joint Hull Understanding was revised and the outstanding feature of the revision was that no further "surcharge" or all-round increase in premium was required of shipowners while the sliding scale system of increasing premiums in proportion to the claims record of a risk was retained. The "surcharge" system was first introduced shortly after war broke out and by the end of 1941 it has resulted in cumulative increases equivalent to 37½ per cent. on the basic premiums of 1939.

During 1942 few of the company chairmen expressed any decided views on market affairs in general and still fewer on the hull market situation. No doubt they were wise, but Sir Edward Mountain, who alone among chairmen is in a position to have an intimate knowledge of hull business by virtue of his previous experience as an underwriter and chairman of the Joint Hull Committee, said that the continued increase in the cost of repairs was difficult to estimate while repairs effected in America resulted in further increases by reason of the exchange value of the dollar. Deferred repairs would, in Sir Edward's opinion, be felt even more acutely in this war than the last. Profits must remain very uncertain unless further substantial increases in premium were obtained.

Now this was said in June, but the situation had not changed since January, when the Joint Hull Committee had recommended that while no further "surcharge" be required on hull renewals, the sliding scale system should continue, but where, in 1941, the figures of the last two closed accounts, plus outstanding claims, had been taken for the purpose of ascertaining whether any increase in premium should be required on a renewal (and, if any, the measure of increase) in the 1942 formula the last three closed accounts were to be taken for this purpose. This variation maintained the principle of the 1941 Understanding, which was that shipowners should be assessed on the results of war years, and, at the same time, be freed of the claims record of the more remote years in respect of which they had already paid increases under the sliding scale.

This, then, was the basis of hull rating during 1942, but it represents largely a blind guess. Underwriters admit that they have no means of knowing what will be the result of current and recent hull accounts. Not only the factors mentioned by Sir Edward enter into the situation to make it obscure. For one thing, there is a dwindling volume of business resulting from the loss of tonnage by war and marine perils. Normally such losses would be made good by new construction, but the amount of new tonnage coming into commission under private ownership is negligible compared with the amount commissioned for the Government account and not insured in the open market.

This question has undoubtedly been giving underwriters much concern. It is entirely uneconomic to make a book of risks which diminish in number from year to year because, while losses have to be paid, no new premiums are being received to maintain the fund out of which claims are met. Reduced to absurdity, the situation would eventually result in the market being left with one ship to insure, having paid losses on all the others which had previously been insured. Their premium income would be infinitesimal, while their outgoings would have been enormous by comparison.

It is common knowledge that there is a vast volume of tonnage owned or controlled by the Government in respect of which no marine insurance is effected, and this volume will increase as the war goes on. In the cargo market almost the same problem has been solved by the placing of the vast open covers on cargo shipped for the Ministries of Food and Supply. Circumstances, which have been considerably modified during 1942, stood in the way of any similar solution of the problem of uninsured Government tonnage during the last two years or more, but it is considered that this unsatisfactory state of affairs cannot continue indefinitely.

If, as the Kennet Committee's report lays down, marine insurance is an essential industry, and one which should be maintained at a high pitch of efficiency both for present needs and in view of the pressure which experience foretells will arise after the war, then surely it is essential that the market should not be starved of business represented by this purely merchant tonnage virtually owned by the Government, but largely, if not entirely, managed for the Government by established shipowning firms.

The tonnage is to all intents and purposes Merchant Marine, and as such is the lifeblood of the marine insurance market. If the supply of that lifeblood is withheld, the ultimate result must be an anaemic market, weakened by lack of nourishment and unable to cope with the rush of business which must inevitably follow upon the restoration of normal trade channels and the flow of trade along those channels created by the urgent need of new raw materials and manufactured goods in newly liberated countries and those in which a vacuum, created by war conditions, will require to be filled at the earliest possible moment that circumstances permit.

One more factor which is making the rating of hull business more and more difficult is the artificial restriction of tonnage values. Since hull values for war risks are virtually restricted by the conditions of the Government's insurance scheme, marine values have been similarly restricted by a reflex action. The extraordinary low level of tonnage values at a time when tonnage is scarce is undoubtedly the result of restricted war risk values.

No shipowner is going to pay more for a ship than the amount for which he can insure her against war perils. To do so would be to risk losing the difference between the insured value and the purchase price if the ship was lost by a war peril before that difference could be made up out of earnings. Undoubtedly this situation has caused shipowners to cover their vessels against marine risks on values far below those which would be current if there were no restriction on war risk values, and the result is that marine underwriters are bereft of an increment which would normally result from the application of current rates to increased value.

With all these handicaps, underwriters have been able to form no reliable estimate of the true state of their recent hull accounts. They have had to base their opinion on known factors with a full appreciation that unknown factors of first importance are operating to make or mar their business.

In the circumstances the Hull Understanding of 1942 seems to represent a reasonable compromise with fate. The machinery for increasing premiums on risks which have not brought good results has been kept in operation, and the further increase of premiums by any "all round" increase has been abandoned. It may well be that the Understanding of 1943, when it comes to be announced, will prove to be on very much the same lines as that of 1942, but there may be some modifications aimed at meeting the situation as it appears after a year's experience of an Understanding which

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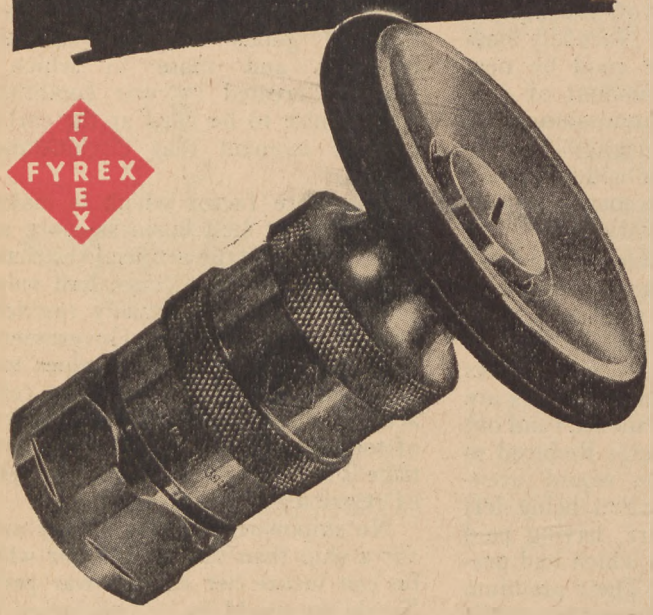

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has relied solely upon the sliding scale to obtain increases in premiums.

Cargo Business

In the cargo market, apart from the "surcharge" system, which has been dealt with in its general application to the situation, the chief supply of business has been from the two vast open covers effected for the Ministries of Food and Supply. It is common knowledge that the first year of these two covers yielded a substantial loss. That was the 1940 account, written largely on the first schedule of the cargo surcharges which experience proved to be far too low, both in general business and where the Government contracts were concerned.

The increase in surcharge rates of 1941 brought gross rates nearer to an economic level and further readjustments in 1942, though comparatively minor, effected further improvements. Perhaps one of the most effective factors in putting cargo business on a better basis was the graduation of the surcharge rates to cover policy conditions more comprehensive than full with average clauses. In any case it seems that so far as the open covers for the Ministries are concerned the account of 1941 will yield much better results than its predecessor; probably it will bring some profit.

If this be so perhaps even better results may be expected from the covers of 1942 and if this be the case the aggregate result to the end of that account will reflect true underwriting technique. Business which proved unsatisfactory will have been brought round to a more satisfactory basis by cumulative improvements and to accomplish this is far better underwriting than to scrap business which has brought a loss simply because it has brought a loss.

As for cargo business apart from the very large bulk brought to the market by the Ministries' covers, it probably follows the fortunes of those covers, not perhaps in exact pattern but on broad lines. It seems unquestionable that the Ministries have obtained a very satisfactory bargain, justified by the vastness of the bulk of business transacted under two comprehensive instruments which for practical purposes may even be regarded as one, but none the less a bargain compared with business effected for individual accounts.

It must be remembered that while the business placed in the market outside the covers is reduced in volume not only by reason of the loss of so many foreign connections but also because the imports insured for the Ministries are really part and parcel of the market's peace-time raw material and represent, in bulk, what previously came to underwriters in small parcels. What remains is such private trade as this country and her Allies can still carry on, and in this trade underwriters still retain the right of selection which they abandoned voluntarily when they wrote the *table d'hote* contract of the Ministries. Because of this right of selection results on this residue of trade may differ so far as individual accounts are concerned, but on broad lines the market seems to have fared not badly on the 1941 cargo account and may fare still better on the account of 1942.

Extended Transit Cover

One very important development of 1942 was the adoption, in May, of the War-time Extension Clauses for use in conjunction with the Institute Cargo Clauses. On broad lines the Extension Clauses give, in return for a prepaid additional premium which is unreturnable, cover against those contingencies in respect of which an additional premium is payable, under the Institute Cargo Clauses, if they eventuate.

For instance, where the Warehouse to Warehouse Clause requires that goods shall be carried "in the normal course of transit," the Extension Clauses give practically unlimited transit within the general framework of the policy. Where deviation and the exercise of liberties under the contract of affreightment are "held covered at a premium to be arranged," under the Institute Cargo Clauses, deviations and liberties with their resultant variation of risk are covered under the Extension Clauses without additional premium other than that paid initially when the risk is effected.

The underlying idea is that since in war-time the course of transit is liable to be varied and liberties granted under contracts of affreightment are likely to be exercised, it is a great convenience to the assured to be covered against such variations of risks for a comprehensive initial premium and for him to be free of the obligation of ascertaining whether there has been any variation of risk and of informing his underwriters and paying an additional premium if there has.

The Extension Clauses do not give the assured any cover that is not latent in the Institute Cargo Clauses, but they do away with the provisions with regard to making latent cover actual by giving advice of variations and the payment of additional premiums, in return for an increased initial premium, none of which is returnable even if the departures from the normal course of transit, deviations and other contingencies in respect of which the premium is paid do not occur during the insured voyage. Undoubtedly the new clauses are a major contribution to the convenience and protection of merchants and shippers in the difficult conditions of overseas trade during the war.

New Clauses and Warranties

In addition to those noted above, some important new and revised clauses have been adopted during the year. The first of these was the War Cancellation Clause of January 1, clarifying and elucidating the circumstances with regard to risks affected when underwriters give notice of cancellation of open covers and similar contracts. In effect, the new clause gives cover at pre-cancellation rate to such risks as have actually attached when notice of cancellation takes effect.

Where a shipment has been declared but not loaded on board the overseas vessel, the pre-cancellation rate applies provided the goods are loaded and the vessel sails within 15 days of the date on which notice of cancellation becomes effective. If this period of 15 days expires before the vessel sails, the pre-cancellation rate no longer applies and fresh arrangements must be made. Generally this means that the rate of the contract re-instating that which has been cancelled will apply.

It should be noted that the clause gives both insurers and assured the right to cancel contracts by giving 48 hours' notice. This complied with the requirements of the Advisory cargo war risk schedule current when the clause was adopted, but in the schedule No. 52 dated July 22, the preamble, in which it had previously been laid down that notice of cancellation of war risks must not exceed 48 hours, was altered to make the maximum period of notice seven days. This, presumably, means that the period of notice in the War Cancellation Clause may also be altered to seven days if required.

Another important clause revision of 1942 was the amendment of the Protection and Indemnity Clauses of the Institute Clauses for Builders' Risks and the Institute Clauses for Port Risks. It will be remembered that in 1941 underwriters found it necessary to provide against the circumstances arising out of a case in which they found themselves liable, under P. and I. Clauses, for the cost of removing a war wreck although the policy in question was subject to the F.C. & S. Clause.

Their liability arose because, on the precedent of the Warilda case, the

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P. and I. Clause is additional to and not a customary part of the marine policy. Temporarily they obtained the desired effect by adopting a War Exclusions Clause by which P. and I. risks were made subject to the F.C. & S. Clause.

The investigation of the P. and I. Clauses as a whole arising out of this development led to the realisation of certain defects in the clauses as a whole. In particular it came to notice that while the clauses provided against legal liability for the removal of wreck they did not apply to cases where there was no legal liability to remove a wreck and technically did not protect the assured against the expense of removing a wreck from his own fitting-out yard or other premises, because he was under no legal liability to carry out such removal.

While underwriters would never have taken advantage of this technicality, it was deemed desirable to rectify the obvious defect in the clauses and the opportunity was seized to make a complete overhaul of the P. and I. Clauses. The new set was adopted under date of August 1. It constituted entirely new P. and I. Clauses to be attached to or rather superimposed upon the superseded clauses in the Builders' Risks and Port Risks Clauses—a war-time expedient valuable in that it saved much reprinting and waste of paper. The principal feature of the new clauses was that cover was given in respect of the cost of removal of wreck from "any place owned, leased or occupied by the assured," but other necessary amendments were made, including the incorporation of the Free of Capture, and Free of Strikes Warranties as part of the P. and I. Clauses, thereby eliminating the previous disadvantage which had required the War Exclusions Clause of 1941 to be adopted. By making the P. and I. Clauses subject to the F.C. & S. and Free of Strikes Warranties, a War and Strikes Inclusion Clause was required to meet the circumstances when the excluded risks were to be covered and the necessary supplementary clauses to effect this were adopted at the same time.

Another and most important clause revision of 1942 was the adoption of an entirely redrafted set of clauses for the insurance of disbursements and similar interests on a "total loss only and excesses" basis. The outstanding feature of the new clauses was a provision by which underwriters stipulated that if a shipowner elected to collect a claim for partial loss on the policies on hull and machinery when the vessel was in fact a constructive total loss, no claim was payable under the total loss cover of the clauses.

This met the circumstances in which, owing to the difficulty of replacing lost tonnage, a shipowner refrained from claiming a constructive total loss on his main policies, thereby retaining the vessel which, if he had claimed a C.T.L., would have become the property of the underwriters. His 100 per cent. partial loss claim would go a long way towards meeting the cost of repairing the ship and if, in addition, he was allowed to claim a constructive total loss on his disbursements policy, underwriters on the hull and machinery would be deprived of their right of subrogation, while those on the T.L.O. Risks would have to pay, and the market as a whole would have a bad bargain.

Another feature of the new clauses was the complete overhaul of the provisions with regard to "excesses." Where previously general average, salvage, salvage charges, sue and labour charges and collision liability had been covered under one comprehensive wording which, by reason of being applied to all these risks, was defective, the new clauses cover excesses in respect of general average, salvage and salvage charges under one paragraph, sue and labour charges under another, and collision liability under a third. The new set is undoubtedly a great improvement.

Another clause adopted during the year was a "recommended" clause for covering additional expenses in connection with cargo when the voyage or adventure was frustrated or terminated elsewhere than at the contract destination by war conditions or by liberties granted to the shipowner in the contract of affreightment.

These "recommended" clauses, which standardise a number of unofficial clauses, many of which were unsatisfactory, are not Institute Clauses, because they are not really marine clauses but are non-marine clauses for use in covering contingencies arising out of a marine adventure. Nevertheless they will, no doubt, become the generally accepted clauses of the market for the purpose for which they are devised.

While no changes in the Institute Warranties were made during 1942, February saw the adoption of a revised Ship Warrant Warranty, the policy condition adopted voluntarily by underwriters to ensure that only interests approved by the national authorities obtain the benefit of insurance and that failure to comply with the requirement that every vessel engaged in trade for the United Nations shall have a ship warrant or its equivalent, voids the policy.

The new Ship Warrant Warranty was made necessary by the entry of the United States into the war. Its provisions are clumsily drafted and have the appearance of emanating from Civil Service rather than from market sources, but they have been accepted willingly by underwriters as part of their contribution towards the war effort.

In conclusion it may be said that during 1942 the marine insurance market has fully upheld its great traditions as a bulwark of the nation in time of war. Difficulties due to the calling-up of experienced staff have been accepted and overcome cheerfully and with enterprise. One measure aimed at economising in both man-power and paper was the setting-up of the special department of the Institute of London Underwriters to deal with all matters concerning the companies' combined policy, which is one document subscribed by all the companies on a risk which are, in this manner, freed from the necessity of preparing and issuing individual policies.

Despite the uncertainty as to the outcome of underwriting in 1942, the year has been one of progress and enterprise. The financial stability of the market as a whole remains unimpaired, the readiness of foreign interests to accept the policies of Lloyd's underwriters and the established British companies being eloquent of the high measure of security such policies provide.

Undoubtedly this war has found the market no less able to maintain its prestige than the last, and it is perhaps worth noting that the undesirable promotion of "wild cat" marine insurance concerns which was a feature of the last war has, so far, been entirely absent during that which has now raged for over three years.

Perhaps the best note on which to end this survey is to be found in the report of the Kennet Committee on man-power in which the importance of marine insurance both as providing a valuable invisible export and as ensuring the security of national trade, is emphasised. No such emphasis could have been placed upon the importance of any organisation which was not fulfilling its purpose to the utmost of its capacity, and unwittingly the committee seem to have paid to the marine insurance market a very high tribute indeed.

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SALVAGE HELPS TO DIMINISH TONNAGE LOSSES

By FRANK C. BOWEN

WHEN the Spanish Government recently published its shipbuilding programme it was found to include no less than 15 salvage steamers and one motorship, the latter having a tonnage of 145 and a horse-power of 400, and the former ranging up to three 900-ton ships of 800 horse-power each. The Spanish coast was bestrewn with wrecks after the Civil War, and as the government intended to build up the shipping industry with very poor constructional facilities it was logically starting with the salvage of a large number of vessels which could be repaired comparatively easily.

That will no doubt be the general policy after the present war, when there is bound to be an immense demand for tonnage during the reconstruction period, although doubts are very generally held as to the economic possibilities of a government salvage service, except in war-time when it is unavoidable. While ship values and shipyard prices are at a high level salvage will offer excellent opportunities for private enterprise, but there is bound to be the danger of a sudden slump catching the business as it did between 1921 and 1923.

The salvage business is now a very important auxiliary to shipping, but its development is comparatively modern. Until the 19th century most salvage efforts were confined to saving masts, spars and fittings, or refloating ships which were ashore, and attempts to raise sunken ships were rare. One of the earliest instances was when the crack ship of the Royal Navy, the *Mary Rose,* foundered in 1545 and a party of Italians agreed to salve her. They used barges as primitive camels, lifting with the rising tide, but as they made these fast to the masts of the wreck, and immediately pulled them out, Henry VIII. paid them their expenses and sent them home.

Temporary repairs behind cofferdams and stanking, which is a variation of the cofferdam system by raising a vessel's hull to a point above the waterline with caulked timber, were used from very early days right down to modern times. When the famous *Great Eastern* damaged her bottom on a rock near Long Island in 1862 and there was no American dry dock capable of taking her, a cofferdam was built in New York and inside it 100ft. of new plating was worked into her hull. The damaged Russian ships at Port Arthur in 1904 and 1905 were also repaired by means of cofferdams, and it may be mentioned that the salvage of these prizes gave the Japanese their first taste for salvage work, which they studied in Britain and later carried to a very high state of development.

It was the great increase in the value of steamships in the mid-19th century which gave the salvage industry its real chance and introduced scientific methods. There were many cases of expensive machinery being taken out of a wreck and placed in a new hull and steam tugs, which were given real power about the time of the Crimean War, were quickly used for salvage work. Most of their jobs were before a disabled sailing ship got on to a lee shore, when the claim for salvage award was made through the Admiralty Court in the ordinary way, but very soon a number of them were employed by the various salvage associations at so much per tide after a ship was actually wrecked and would normally have been regarded as hopeless by the tugowners. The associations owned the best gear available, which was put into the tugs when they started on the job, but the owners soon installed powerful pumping apparatus, both in the engine-room and portable, in the new tugs which were built.

The establishment of the three great British salvage associations in the 'fifties marked an immense forward step. The formation of the Salvage Association itself was approved by Lloyd's in 1856 and underwriters contributed to the initial cost. The subscribers, who included insurance companies and shipowners, agreed to meet any deficiencies up to their original contribution, and although the Association did not own floating material itself its experts went out with the contractors, materially assisting in the work as well as having a great influence on checking pilferage.

The Glasgow and Liverpool Associations were both founded in 1857, but it was not until about a dozen years later that the latter, which was the only one to own its own ships, purchased the old gunboat *Hyaena* in co-operation with Messrs. Joliffe, the well known Liverpool tugowners, and followed her with such well known ships as the *Ranger, Plover, Linnet* and *Trover.* The Liverpool and Glasgow Associations were amalgamated in 1923.

In the latter part of the 19th century the salvage business was very much more profitable to British owners than it became later, and practically every tugowner regarded it as a very important part of his work. It was also taken up freely on the Continent.

The first Continental owner to go in for it was Svitzer, a Copenhagen timber merchant, who started as early as 1833 with a big rowing boat and two small sailing ships, with the minimum of tackle, to salve timber cargoes and, where possible, the ships. Later he turned to steam, and his business attained very large proportions; reversing the usual order, it was not until 1924 that his successors added a towing section.

The Dutch firm of Smit and Co. was in the harbour and short sea towage business long before the numerous wrecks on the Dutch sandbanks tempted them to go in for salvage, but once they had done so they introduced the most up-to-date principles and very expensive material, copying Svitzer in stationing tugs in foreign ports alongside the most dangerous trade lanes. The Bugsier Co., of Hamburg, was founded in 1889 as a tramp concern, but soon went in for salvage work as well, and in 1926 amalgamated with the Schuchmann Co., which dated from 1884.

Other foreign salvage concerns, most of which are of much later date, include the Scandinavian Salvage Union, which was a combination of Scandinavian salvors operating in distant seas during and after the late war. The Baltic Salvage Association of Estonia has been working since 1888, and when the present war broke out had a useful if miscellaneous fleet. In Belgium the Black Funnel tugs of Antwerp did o lot of salvage work, as did the Abeille tugs in Havre, and those of the Scherifienne Co. at Casablanca. The Sorima Co., of Genoa, is the best known Italian Co., while at Piraeus Messrs. Stringo, Matsas and Sons and Vernicos did a lot of work. Before the last war Vincent Grech had quite a big fleet at Constantinople, including some of the

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giant tugs built for handling the sailing ships on the Hughli, and the greater part of this business was taken over by the Ocean Salvage Co., until the Turks reserved it for the Turkish flag.

In the Far East the Tokio Salvage Co., of Tokio, and the Teikoku or Nippon Salvage Co., of Osaka, were very prominent under the Japanese flag, and the latest reports from the Pacific theatre of war suggests that they have recently been working on a large number of war wrecks for the Government. British enterprise in China established the Shanghai Tug and Lighter Co., and the Hong Kong and Whampoa Dock Co., which did a lot of salvage work with big tugs.

The Nederlandsche-Indische Coal Co., the Perim Coal Co., the Mihanovich on the River Plate, and the Waratah Tug and Salvage Co. of Sydney, New South Wales, combined salvage with other work. In the United States the Merritt, Chapman and Scott Co. is an amalgamation of interests which have been in the salvage business since the 'sixties, and has a very fine fleet distributed along the Atlantic coast. In the Pacific, the Shipowners and Merchants Tugboat Co., popularly the Red Stack tugs, do a lot of work with the *Sea Salvor* and other ships, while in Vancouver the Pacific Salvage Co. owns one of the finest salvage steamers in the world in the 1,164-ton *Salvage King*.

Mention has been made of the way the high price of machinery in the early days of steamers caused many engines to be recovered for installation in new hulls, but in later times the same factor has prompted the salvage of half ships, leaving the remainder on the rocks. The first sensational case of that kind was the Elder Dempster steamer *Milwaukee* which stranded near Aberdeen on her maiden voyage in 1898. She was cut in two by a belt of small charges of dynamite, the firmly-wedged bow was left where it was, and the after part with its machinery was towed to port to have a new bow built on to it.

Conspicuous is the case of the P. and O. liner *Australia*, which was wrecked in 1904. The wreck was bought for £350 by Mr. J. G. Aikman, a Melbourne draper, £290 of this being for the hull and £60 for the cargo which remained on board. He expected that his venture would give a profit of at least £2,500 but the actual figure was nearly £200,000, so he retired from business and went in for politics. Before the last war all such jobs were very severely handicapped by the limited depth within the reach of the old-fashioned rubber diving dress; the all-steel deep-water dress was not invented until the middle of the struggle and attracted comparatively little attention until afterwards.

The number of ships sunk during the last war, especially in the Mediterranean, gave the neutral contractors a fine chance and they took full advantage of it, conspicuously the Svitzer and Smit firms. Naturally, the romantic possibilities of the job attracted the enthusiasm of amateurs without the least knowledge of the business and innumerable suggestions were put forward.

During the last war nearly all the salvage work round the British Isles, and a great deal in the Mediterranean, was done by the Admiralty Salvage Section, which had practically no publicity at the time and little enough afterwards. In the early part of the war private enterprise was given a certain amount of opportunity under very strict war-time restrictions, but in November, 1915, the Admiralty Salvage Section was founded and took up all the material and trained personnel of the British companies.

The Liverpool Salvage Association's *Ranger* and *Linton*, with the famous Captain Frederic Young to operate them, formed the nucleus of the service, which was manned very largely by the Royal Naval Reserve. The Admiralty already had a certain number of ships commissioned as salvage vessels, manned from the Merchant Service, and these were embodied into the section which was originally under Captain C. Greatorex, although Captain Young, made Commodore R.N.R. and knighted, took over the control in 1918.

Originally it confined its activities to naval work but as the national importance of merchant shipping was gradually realised by the authorities it was extended to saving damaged merchantmen as well, and was soon covering a very wide field. Apart from its purely naval work, which was invaluable, it was reckoned that it salved about £50,000,000 worth of hulls and cargoes. There were also a certain number of local salvage units, for example the one attached to the Dover Patrol, where Captain John Iron, Harbour Master of Dover, was made chief salvage officer and salved 116 ships. The Mersey Docks and Harbour Board also carried out valuable work.

In addition, the Rescue Service was started early in 1917, consisting of powerful tugs stationed at various ports to assist and rescue disabled ships. To begin with commercial tugs were requisitioned for this work, but the famous "Saint" tugs were afterwards built by the Navy, and to the end of the war the Rescue Service towed 140 ships into port and assisted 500 others which had been damaged by enemy or marine risks.

During the war there was sufficient money, either from the Treasury or from the generous awards which were made to successful private salvors, to contrive a number of improvements on the material side. Various types of all-steel diving dresses, which were not limited in the depth of their operations like rubber suits, were evolved in the United States and Europe. Few of them permitted the diver much freedom of movement, but they allowed him to go down to colossal depths and to direct mechanical appliances.

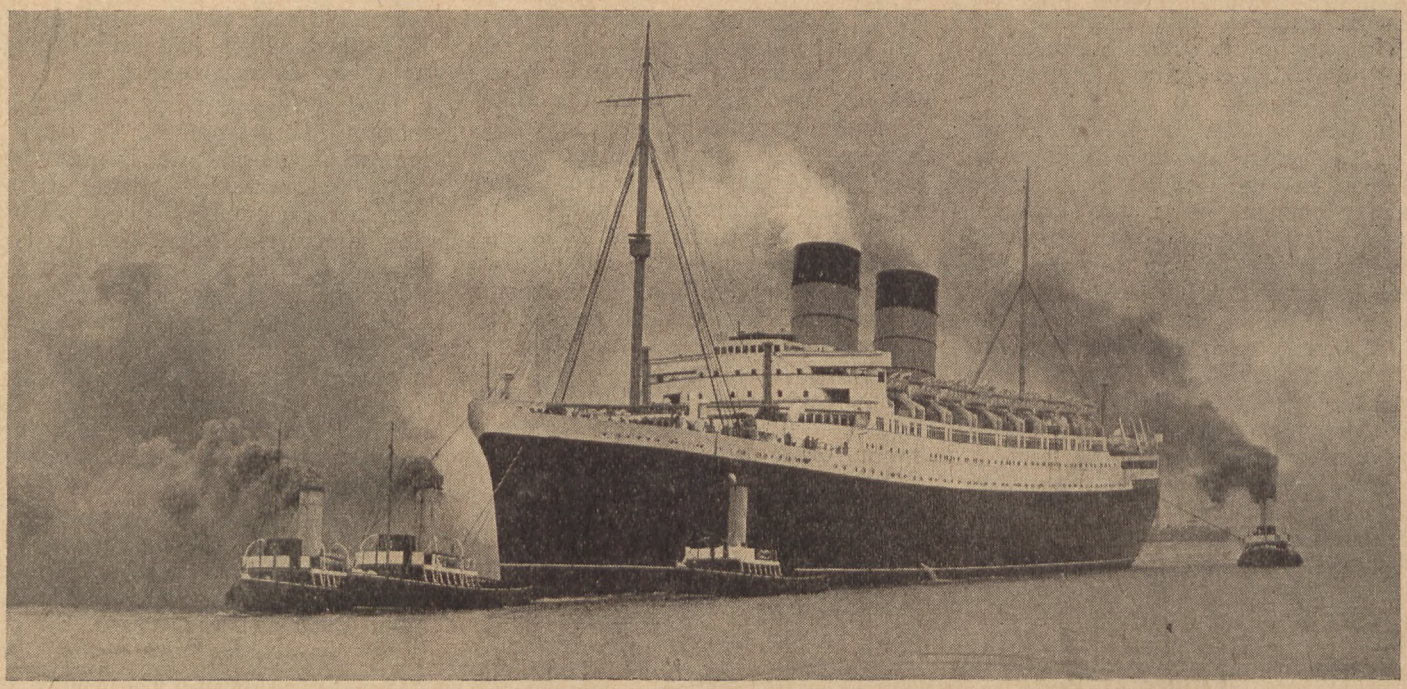
Another particularly useful device was the standard patch devised by Commodore Young, made on the principles of a roll-top desk so that it could adapt itself to the curves of the hull. Made watertight with cement, the patch proved invaluable. Young had always been an advocate of compressed air for salvage work, and he had the opportunity of proving his theories in many successful jobs.

Immediately after the war another useful device was Vickers' patent canvas pontoon, made of canvas and wire, which could be put into place deflated, either outside or inside the ship, and then inflated by compressed air.

For some time after the war the price of tonnage continued to rise, and it was well worth spending large sums on war wrecks. Numerous private companies were floated to take advantage of the permission to work on these wrecks on condition that they took all the risk and paid a percentage of their salved value to the Government.

All round the coast these concerns worked with salvage material which was good, bad and indifferent, ranging from obsolete steam yachts designed on the old narrow plank-on-edge principle, to useful tugs and former men-of-war like H.M. sloop *Buttercup* of 1915, which was converted into the salvage steamer *Semper Paratus*, and which still features in the Italian Navy List as the *Tesio*. Some of the firms were associated with scrapping interests, while others, whose resources were not equal to salving ships of any size, contented themselves with recovering what fittings they could and finding a profitable sideline in contracting to disperse wrecks in the fairway.

Then freights suddenly slumped, the price of ships slumped with them as a matter of course, and there was



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an end to the British salvage business on a large scale. Most of the new firms went out of business, but some facilities were retained by the more important and financially prudent concerns. British labour conditions were very much against salvage work with its long waits for opportunities, and as there was no coastal reservation for the business they had to face the competition of Continental rivals equipped with magnificent material and enjoying far better conditions of labour.

The salvage associations retained their plant and most up-to-date tugs were well equipped with pumps of various kinds. Several shipbuilding companies specialising in repair work have maintained a plant of pumps, oxy-acetylene cutters and the like, which they ship on board private tugs when necessary. Many of the port authorities maintain their salvage ships, some like the Port of London Authority working in the port only, some like the Dover Harbour Board covering a wide area, and some permitting their material to be hired. It was not until shortly before the outbreak of the present war that an attempt was made to revive British deep-sea salvage work with the construction of the *Neptunia* and *Salvonia*.

In addition to salving ships, vast quantities of gold were recovered between the two wars. The White Star liner *Laurentic* had been torpedoed in 1917 with gold and silver on board to the value of about £5,000,000 bound for the United States. A very small portion of the treasure was recovered at once, but between 1919 and 1924 operations were resumed season after season and eventually £4,958,708 was recovered at a cost of £128,000.

The P. and O. liner *Egypt*, sunk in collision off Ushant in 1922, took £1,054,000 in gold, silver and coin down with her in 400ft. of water. Various attempts were made to salve this, and finally the Italian Sorima Co. located the wreck and, working with the most ingenious and up-to-date plant, recovered the greater part of the treasure. The job of salving most of the scuttled German warships at Scapa Flow, although they were only fit to go to the scrappers, was a creditable piece of work by Messrs. Cox and Danks in the early days and later by Metal Industries, Ltd.

On the Continent the efforts of the Epron, the Soviet Government Ship Salvaging Trust which was founded in 1923, were exceedingly interesting and made a good example of the work that can be done by a Government department when there is no question of economic results. They started with a disappointment; two years' effort to find the wreck of the British transport *Prince*, sunk during the Crimean War, ended in the discovery that it did not contain the money for paying the troops that had been expected.

Up to 1935, however, the organisation salved over 200 ships, including many sunk during the war of 1914-18, and many of the jobs were carried out with the greatest ingenuity against every difficulty. The fact that no accounts were published makes it impossible to estimate their economical, as opposed to technical, success.

Shortly before the outbreak of the present war the Liverpool and Glasgow Salvage Association took over the salvage of H.M. submarine *Thetis*, which had sunk during her trials, and as the ordinary lifting camel was useless in such an exposed position they decided to employ a merchant ship. The vessel had to be of about the same length of the *Thetis*, with decks which permitted large lifting beams to be placed athwartships, good ballast tanks to maintain stability under a great strain, and accommodation for a big salvage crew. Various ships were inspected, and finally the Pelton Steamship Co.'s steamer *Zelo*, of 2,294 tons, was chosen.

Nine-inch wire, tested to 265 tons, was used, but the ship suffered damage during the early stages of the operations and a good deal of the gear had to be altered, steel being substituted for pitch pine for the lifting girders, &c. Gradually the wreck was moved further inshore on each successive tide, until finally it was possible to bring her to the surface by compressed air and she was taken back to her building yard.

When the war broke out the Navy possessed a number of very fine tugs, the remnants of the old "Saint" type, the new 16-knot *Brigand* type with 3,000 h.p. triple-expansion engines and a number of big dockyard tugs. As many of these as could be spared, with all the available private material, were allotted to the Salvage Section which was revived at the outbreak of war. New ships were built and others acquired from various countries; by the end of 1940 the section had already salved over 1,000,000 tons.

Invasion of the Continental countries by Germany, particularly Holland, Denmark and Norway, gave the section the services of invaluable men and material, while a number of first class French tugs were added after the collapse of France. Naturally the greatest secrecy has been observed, for the Germans always make a special point of delivering air attacks on any salvage jobs of which they learn, but colossal figures have been mentioned and particulars of one or two special jobs have been released by the censorship which show the good work done.

The Canadian-Australasian liner *Niagara* was mined off the New Zealand coast in 1940 and went down in 438ft. of water. Captain J. P. Williams used a diving cylinder of his own invention, and in just under a year recovered £2,397,000 worth of gold. The tanker *Imperial Transport* was torpedoed in the Atlantic in 1940 and broke in two. She was in ballast at the time and both ends floated. Her crew returned to the after portion and managed to reach port with it, after which a new forward end was built and welded on.

In America the U.S. Naval Salvage Service won its spurs by salving the new turbo-electric tanker *E. H. Blum*, which was cut in two and sunk by the explosion of five mines. The forward end was taken to port with little difficulty but the after end, containing the valuable machinery, presented innumerable problems. It was finally brought to the surface, towed to port and joined up with the salved fore part.

Perhaps the most romantic case of which news has been released is that of the cargo steamer *Macbeth*, which broke down in mid-Altantic in 1941. The tug *Prudent* was sent out from a Canadian port to tow her back to Canadian waters, but although she located the derelict and got hold she ran out of fuel and had to abandon the job. The famous Dutch motor tug *Zwarte Zee*, reckoned to be about the finest salvage vessel in commission, was then sent out from the British side and in six days had towed her 900 miles to port through appalling weather.

After the war there is bound to be an enormous demand for ships and scrap steel for some years, so that it will be worth while to carry out salvage operations on an even bigger scale than between 1919 and 1921. For the sake of scrap steel it will probably be worth while, for a time at least, to salve hulls piecemeal with the help of oxy-acetylene cutters. But a post-war slump is inevitable, as it has been after every war in British naval history, and the experiences of the last war and this will have to be very carefully considered to decide whether the Red Ensign shall not be given the same salvage facilities as its rivals—facilities which may be difficult to maintain economically in peace-time but which are essential to the country in war.

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"An EXCELLENT JOB has been done" by BRITISH SHIPBUILDERS

—vide Select Committee's Report

By H. E. HANCOCK

IF it were necessary to sum up the activities of our shipbuilding and shiprepairing industries during the past year in a single sentence one could not do better perhaps than use the words contained in the 17th report from the Select Committee on National Expenditure which was issued by the Stationery Office on November 4 last, as follows:—" The committee desire at the outset to state their general impression that in merchant shipbuilding and repairs an excellent job has been done." The reports of the Select Committee do not as a general rule contain lavish praise of the various war industries.

The functions of the committee are to examine the current expenditure defrayed out of monies provided by Parliament for the Defence Services, for Civil Defence, and for other services connected with the war and to report what, if any, economies consistent with the execution of the policy decided by the Government might be effected therein. And in carrying out their duty the members of the committee examine all details with a critical eye. In view of the criticisms which frequently appear in the committee's reports regarding other war activities we can be sure that the verdict, "An excellent job has been done," has been well earned.

The Select Committee on National Expenditure are not alone in their opinion. Sir Earle Page, who visited this country during the summer of last year as the special representative of Australia stated, on his return to Sydney, that " British shipbuilding had become the eighth wonder of the world." Another visitor to this country, the Maharajah Jam Sahib of Nawanagar, one of India's representatives in the War Cabinet, broadcasting his impressions of Great Britain at war, stated that " the most impressive thing he had seen since he had been here was a great shipbuilding area, like a beehive of humming activity. Here was determination, hard work and efficiency equal to, if not more, than he had seen in other spheres."

These are the opinions of critical and independent observers. The views of the British Government were expressed in a message from the Prime Minister which was read at a conference attended by over 1,000 representatives of both sides of the shipbuilding industry held in London on September 23 last. The conference was addressed by the Minister of Labour, Mr. Ernest Bevin, and the First Lord of the Admiralty, Mr. A. V. Alexander. The Prime Minister said: " His Majesty's Government, indeed the British nation, are proud of the work done by the industry to provide the ships of war and merchant ships for the struggle at sea, on which depends the freedom of the United Nations."

The Admiralty are responsible for all merchant shipbuilding and repairing carried out in the United Kingdom during the war; and the First Lord might perhaps be considered somewhat biassed in favour of the industry and what it has accomplished. But, for purposes of record, it may well be worth while repeating what Mr. Alexander said when giving the war commentary at Caxton Hall, London, on October 20 last. After detailing some of the things which had been accomplished he said: " We must feel grateful to the shipbuilding industry as a whole and to the workers in the shipyards for what has been accomplished." Many other tributes paid to the shipbuilding and repairing industries by prominent men could be recalled, but the purpose of this article is not to sing their praises but to make a brief resumé of their activities during another year of war.

First, however, it should be said that despite the pleasure which all connected with the industry can derive from the knowledge of a task well and truly performed, management and workers are far from satisfied with resting on their laurels. They recognise that the Battle of the Seas and the war can be won or lost in the shipyards of Britain and the United States. A great responsibility rests upon the whole of the shipbuilding industry, and this is recognised to the full. Here and there a small minority may not be pulling its weight in the war effort, but the vast majority of the workers are imbued with a spirit of determination to do all in their power to hasten the hour of victory.

It is not permissible to give actual figures of shipbuilding output. There are obvious reasons why such information is not published. If particulars regarding new construction and our losses at sea were made available, the enemy would be in a position to calculate fairly accurately the amount of shipping at the disposal of the United Nations. The Axis Powers know the total amount of shipping possessed by each maritime country at the middle of 1939. By adding new building and deducting losses they would be able to estimate the shipping space available for carrying troops and their equipment to the various theatres of war.

Our naval strategy is determined by the shipping at our disposal. Even approximate figures would enable the enemy to arrive at certain conclusions, and it is in the interest of the United Nations that he should be kept guessing. An example of how the German Admiralty and High Command were misled by the false reports regarding sinkings of Allied shipping issued by the German propaganda department was provided by the recent operations in North Africa when Allied troops were landed at several points along the coast. The enemy was taken by surprise. He had no doubt in his mind that ships in such numbers as were needed for this operation were not available.

Nevertheless, a certain amount of information is vouchsafed on occasion by prominent members of the Government and high officials at the Admiralty. The Prime Minister himself told us about a year ago that United States shipyards were then turning out between four and five times as much merchant shipping as we were building in this country and would be building eight to 10 times as much in 1943. Since we know that the programme scheduled for the American shipbuilding industry in 1942 was 8,000,000 tons deadweight it requires a very simple calculation to ascertain the approximate figure of merchant shipbuilding in this country at the time the Prime Minister spoke.

The First Lord of the Admiralty has referred on more than one occasion to the fact that although we started the war with barely one-third of the shipyard workers we had in 1918 a greater

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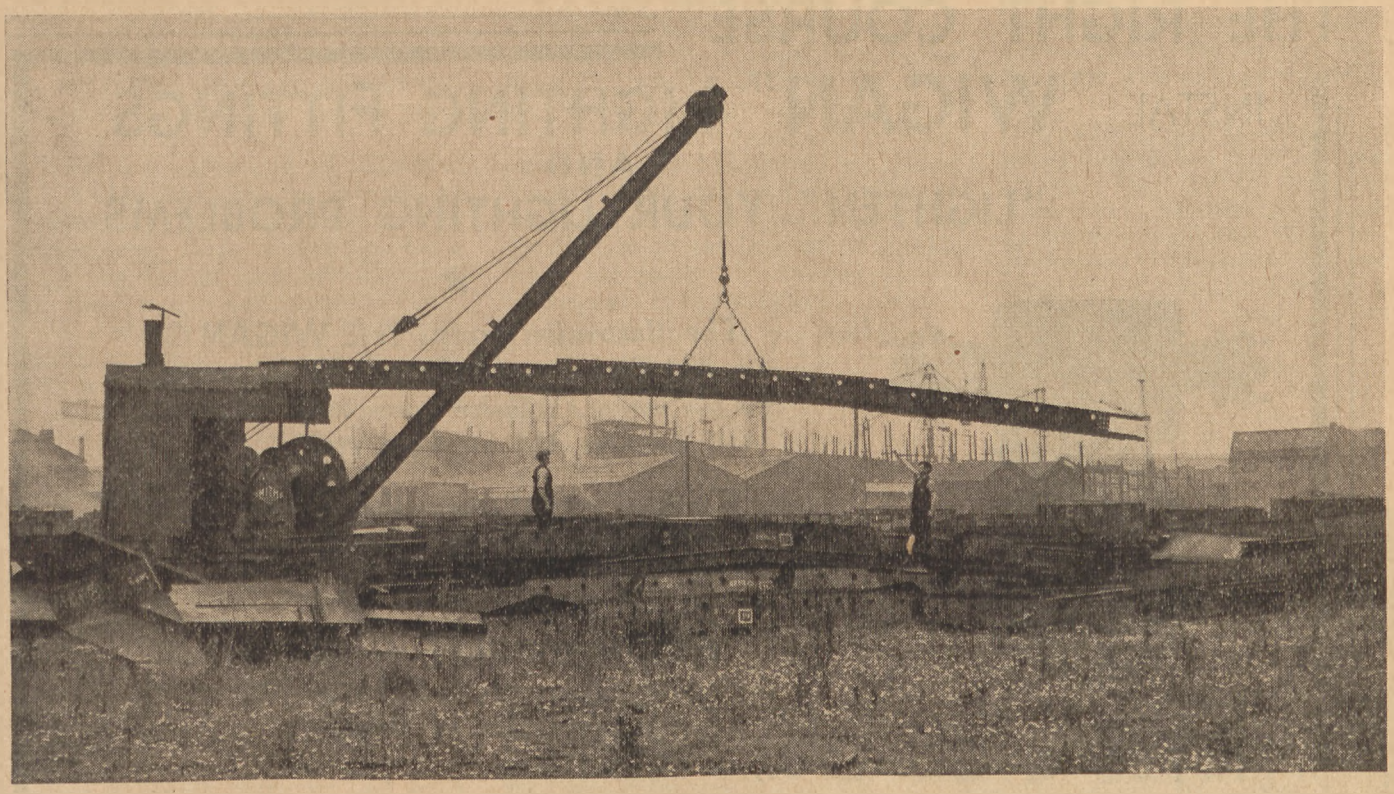

Pre-fabricated hatch end beams, carefully numbered and detailed, being hoisted in readiness for assembly after their arrival at a British shipyard from the factories. Pre-fabricated ships are rising on the stocks in the background.

tonnage of naval and merchant ships had been completed in the first three years of the present war than was the case in the first three years of the last war; and a greater volume of ship-repair work was carried out than during the four-and-a-quarter years of the last war.

Rather more detailed information has been given in respect of ship-repairing—both for naval as well as merchant ships. Repairs have, of course, been on a far larger scale than in the last war. There were then no acoustic or magnetic mines to contend with and, as for air attacks on shipping, it is merely necessary to state that during the last war our losses from air attack amounted to only 8,000 tons of shipping—the equivalent of one tramp steamer—to appreciate that repairs from this one cause alone must have placed a large and additional burden on the shiprepairing industry.

The Third Sea Lord and Controller of the Navy has stated that during three years of this war, 23,000 and more warship repairs and refits were carried out and 140,000,000 tons gross of merchant ships, or 35,000 vessels, put back into service. When we consider that in June, 1939, there were on the British register just over 7,000 merchant ships of 100 tons gross and upwards, totalling just under 18 million tons gross, we can estimate that each ship of the Merchant Navy has come in for repairs of some kind or other at least five times since the war began, or, on a tonnage basis, seven times. I have taken steps to confirm these figures and there is no doubt of their accuracy.

Although it is probable that many of the repairs for which a licence had to be granted were of a minor character and were probably effected while the vessels were alongside discharging cargo, there have been other cases where repairs entailing anything up to eight months in the repairers' hands have been required.

We know, for example, of instances where vessels have come in practically in two halves; but whether the repair required was great or small no ship has been sent back to sea before it was carried out. These figures not only give some idea of the risks which our seamen have to run and the damage which our ships have sustained as a result of enemy attacks, navigating in fog and in darkness without lights, as well as Atlantic storms, they also indicate the tremendous task which has been undertaken and successfully overcome by the shiprepairing yards and the workers.

In spite of these achievements, however, the shiprepairing industry has not been without its critics, who have from time to time made unjust and unfounded accusations of slacking against the men engaged in this class of work. Such criticisms have been effectively dealt with in the columns of *The Journal of Commerce and Shipping Telegraph* as and when they were made and, as a result, there is now a far greater appreciation even among the critics, regarding the British shipbuilding and shiprepairing effort.

Nevertheless, in a survey of the activities of the two industries over the past year the subject cannot be ignored. Constructive criticism is of value, but there are a number of self-appointed critics, actuated by motives which are difficult to understand but frequently by a desire to pay off old scores against certain shipbuilding employers and the Admiralty, and others who consider it their special mission in life to act as "prodders" to incite the workers to still greater efforts.

These critics have much to answer for. Workers in the shipyards have been the target of much of their ill-informed criticism and it would have been little wonder if this had rankled in their minds and created a disgruntled spirit. When men are doing their best it is galling to be referred to as slackers. I would be almost inclined to assert that this depreciation of their efforts was directly responsible for a series of petty little strikes which occurred in the late summer.

Fortunately, however, the majority of the men engaged in the shipbuilding and repairing yards are level-headed

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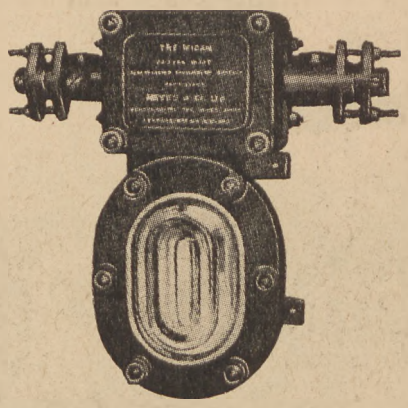

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and are conscious of the great responsibility which is theirs at this time when the fate of civilisation is at stake. As individuals, they are as good and decent as can be found in any other industry.

There are slackers in all industries and in all walks of life, and it cannot be expected that in an industry such as shiprepairing there would not be a small minority of men who failed to pull their weight and absented themselves from work on small pretext. A general statement such as this "cuts little ice," and it may, therefore, be appropriate to quote the remarks of the chairman of an establishment which has carried out repairs to hundreds of ships since the war began, Major G. A. Renwick of the Manchester Dry Docks Co., Ltd. In a reference to absenteeism, Major Renwick said that at Manchester Dry Docks it amounted to less than 1 per cent.; and, he added, "when a man is using his brawn for 60 or 70 hours a week, night and day, week-ends included, I don't think we can cavil if a fellow says he is going to have a couple of hours extra in bed or a couple of hours for relaxation."

This statement, of course, applies to only one yard, and it may be that the record of 1 per cent. absenteeism has not been shared by all the remainder of British shiprepairing establishments; but, if avoidable absenteeism had assumed proportions above normal, the Select Committee on National Expenditure would have been unable to state their general impression that "in merchant shipbuilding and repairs an excellent job had been done." Before issuing their report, the committee made visits to the principal shipbuilding and shiprepairing areas in England and Scotland, where evidence was taken from the local officers of the Admiralty and the Ministry of Labour and from 19 firms engaged in shipbuilding, repairing and marine engineering.

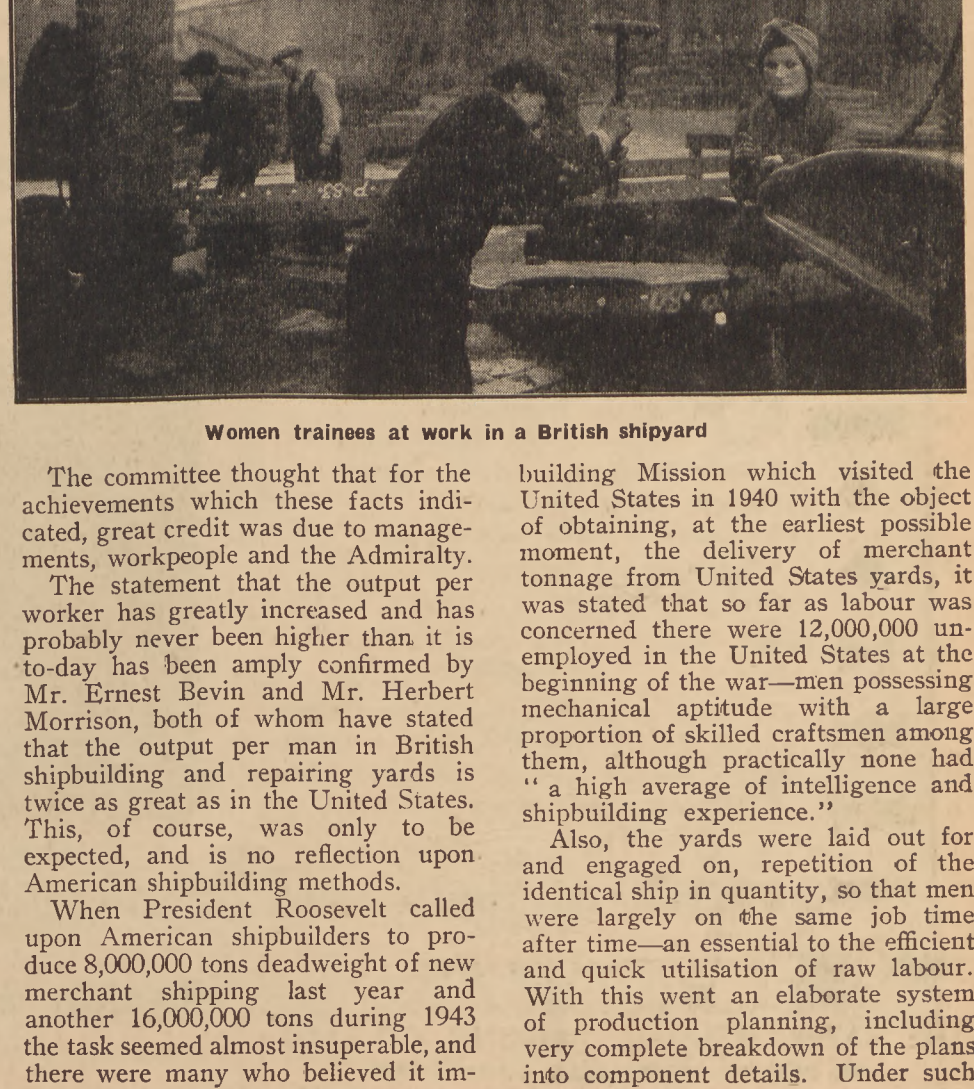
In most cases these establishments were inspected and evidence taken from representatives of the workers. The committee also had the advantage of the views of the chairman of the Ministry of Production's Industrial Panel, who had recently conducted an inquiry into shipbuilding and repairs with special reference to labour. Although the committee were not permitted to state exactly the extent of what had been achieved, they gave a number of facts which supported their view that an excellent job had been done. These were:—

"(i) The rate of output of merchant ships has been greatly increased since the beginning of the war.

"(ii) The programme of merchant shipbuilding which was set for 1941 was substantially attained, and in the first six months of 1942 the programme was slightly exceeded.

"(iii) The arrears of repair work which threatened to become serious at the end of the winter of 1940-41 have been cleared off, partly as the result of the decline in the amount of repair work, but partly also because of improvements in organisation.

"(iv) The output per worker has greatly increased and has probably never been higher than it is to-day. in one region, for example, the output increased by one-half between February, 1941, and June, 1942."



Women trainees at work in a British shipyard

The committee thought that for the achievements which these facts indicated, great credit was due to managements, workpeople and the Admiralty.

The statement that the output per worker has greatly increased and has probably never been higher than it is to-day has been amply confirmed by Mr. Ernest Bevin and Mr. Herbert Morrison, both of whom have stated that the output per man in British shipbuilding and repairing yards is twice as great as in the United States. This, of course, was only to be expected, and is no reflection upon American shipbuilding methods.

When President Roosevelt called upon American shipbuilders to produce 8,000,000 tons deadweight of new merchant shipping last year and another 16,000,000 tons during 1943 the task seemed almost insuperable, and there were many who believed it impossible of accomplishment. America lacked skilled shipyard workers, but United States shipbuilders set about their task with courage and determination.

Without skilled shipbuilding labour new methods had to be adopted, and it will ever be to the credit of American industrialists that the problem of building ships on mass-production principles—turning out hundreds of ships to the same pattern—should have been successfully solved.

In this connection it may be recalled that in the Andrew Laing Lecture read by Messrs. R. Cyril Thompson and Harry Hunter, members of the British Merchant Shipbuilding Mission which visited the United States in 1940 with the object of obtaining, at the earliest possible moment, the delivery of merchant tonnage from United States yards, it was stated that so far as labour was concerned there were 12,000,000 unemployed in the United States at the beginning of the war—men possessing mechanical aptitude with a large proportion of skilled craftsmen among them, although practically none had "a high average of intelligence and shipbuilding experience."

Also, the yards were laid out for and engaged on, repetition of the identical ship in quantity, so that men were largely on the same job time after time—an essential to the efficient and quick utilisation of raw labour. With this went an elaborate system of production planning, including very complete breakdown of the plans into component details. Under such

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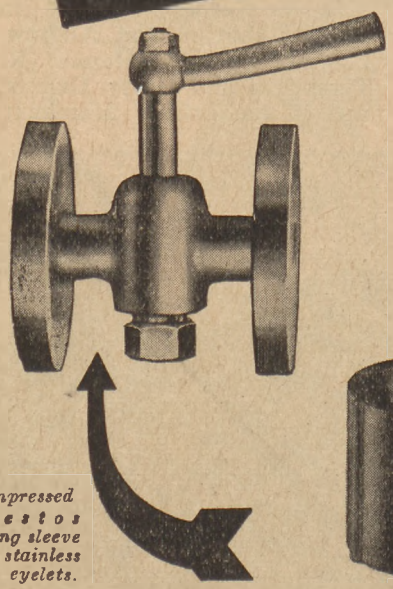

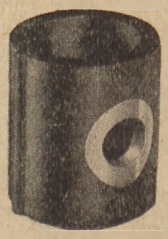

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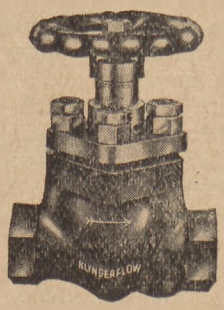

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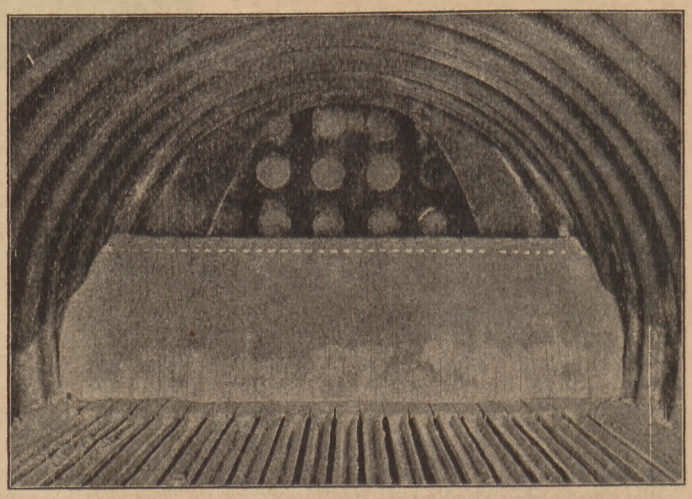

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conditions a man without previous experience, but with aptitude, very quickly became an efficient worker.

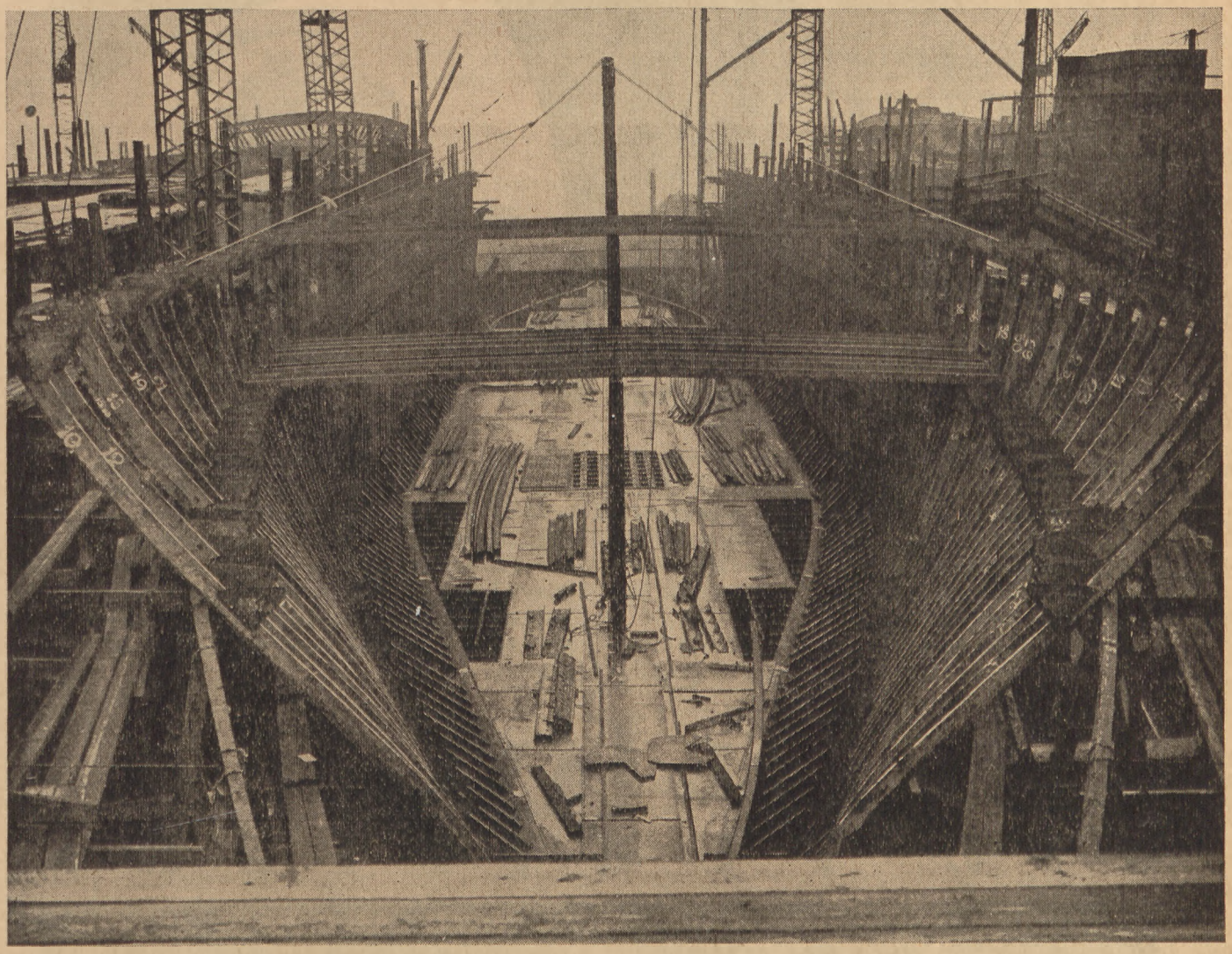
The majority of the American-built ships are welded, but it is perhaps unnecessary to state that the decision to build welded instead of riveted ships was taken because welding labour was available or could be quickly made available, whereas riveting labour did not exist. Actually the construction of a welded ship at present requires more man-hours than a riveted ship; but the subject of welding, both for shipbuilding and repairs, is covered in a series of articles on other pages of this ANNUAL REVIEW.

Ships could be built in incredibly short time in the United States because great numbers of men could be concentrated on the work. In some cases 2,000 men on the average (in some cases considerably more) may be working on one berth as against a tenth of that number in this country; the work can go on day and night by working three shifts; there is no black-out as we know it in Britain, and the climate, especially on the West Coast of California, is much more favourable for outdoor working at all times.

When comparing the outputs of the shipbuilding establishments on both sides of the Atlantic we must not overlook that the conditions are entirely different and construction in one country is influenced by many factors which do not have to be taken into account and provided for in the other. America had a vast reservoir of labour to be tapped, whereas in Britain, where the majority of the people were engaged on work directly connected with the war, labour had to be employed as and where the skill of the workers could be utilised to the best and fullest extent.

The provision of labour for essential shipyard work has perhaps been one of the greatest problems with which the British shipbuilding industry has had to contend. Most of the men who left the industry in the long years of depression but were still physically fit for work in the yards and not engaged on other essential war service have returned to shipbuilding; their numbers were not large, however. Expansion of shipbuilding and ship-repairing can only be brought about by increasing the labour supply and, since most able-bodied men are serving with the Armed Forces, the supply of additional labour which can be trained for work in the shipyards is not extensive. We have to look for additional labour to apprentices and women. The shipbuilding industry has always been more or less short of riveters and there is no doubt that it would be far more difficult to increase the supply of such men than of other trades. Possibly welding can be utilised to a far greater extent in Britain than it has in the past, and the period of training for welders is comparatively short.

The new labour which has come to the yards in recent months is the product of training establishments and unskilled male and female labour. It is possible that the ordinary healthy woman can do the job better than the class of labour now available on the male side. Women are at present



Main framing of a cargo ship, pre-fabricated at an inland factory, being assembled in a British yard.

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doing welding on the ground in sheds and pre-fabrication in British yards, and quite a number are acting as rivet heaters. There probably was at one time a certain amount of prejudice regarding the employment of women in the shipyards, but it is recognised as more than ever necessary now that the reservoir of available male labour is drying up.

Most of the shipbuilding districts are short of labour and there are still a number of merchant shipbuilding yards where it would be possible to increase the labour forces considerably. This is a question which has received and is still receiving the closest possible attention not only of the shipbuilding industry but the Ministry of Labour and the other Government departments concerned.

With its present resources and the labour available, however, the shipbuilding industry has played an important and most vital part in our war effort. Although we have built and repaired 30 per cent. more shipping than in the corresponding period of the last war with 100,000 fewer workers a great deal of the credit must be given for this achievement to the management. Labour has done its part, but without efficient management and planning such a result could not have been obtained.

As stated in the report of the Select Committee on National Expenditure the organisation of the various trades and of the flow of materials within the shipyard so as to secure the minimum of hold-ups is a highly complicated business, more complicated than the work required in progressing the manufacture of an article in general engineering. Labour has to be moved from job to job and the work has to be arranged so that workmen do not have to wait for the next job and are available as soon as they are needed.

In a shipyard with a number of berths in each of which lies a ship in a different stage of construction, the work has to be planned so that the demand for workmen in each trade is as constant as possible. Some yards may be more efficient than others, but it is pointed out that the Director of Merchant Shipbuilding maintains records which show the estimated and actual times occupied by successive stages in the construction of each ship and, when these records indicate that a yard is not producing as well as it could, the matter is taken up with the management. There is a general pooling of ideas with the object of attaining the utmost efficiency.

The merchant shipbuilding resources of the United States have been utilised in the main for the construction of cargo-carrying ships with the least possible delay, and vessels of the "tramp" class have provided the greatest output from British yards. That is not to say however, that the full energies of the merchant shipyards have been confined to the building of this type of ship; but, when war needs are closely studied, it becomes obvious that tramp ships must predominate in our shipbuilding programme.

British shipyards have, however, turned out other types of ships which are essential, such as tankers, coasters, tugs, colliers, and a fair number of cargo liners. We have lost a number of refrigerated ships and, since such vessels take a considerable time to build—in some cases as much as two years—there was a prospect at one time that the civilian meat ration in this country would have to be reduced unless more refrigerated ships could be placed in service. It is an indication of the resourcefulness of the industry that a solution of the problem was found when it was decided to convert or change the design of a number of ordinary tramp ships then under construction to enable them to carry refrigerated cargoes.

Such ships have proved very successful and their cargoes have been landed in this country in good condition. Their capacity is not, of course, so great as that of the large liners which used to be regularly employed in the Australian meat trade, and which had a refrigerated cargo capacity of about 500,000 cub. ft. These converted tramps were given between 250,000 and 300,000 cub. ft. by fitting two, three or four holds as large refrigerated compartments. Little difficulty was experienced in obtaining the necessary installation and refrigerating machinery, and it was stated that at one time last year there was more than twice as much refrigerated work in hand in British merchant shipbuilding yards as at any previous time before the war.

Another problem which has been solved—or, at least, is on the way to solution—is that of the singing propeller. This is a problem that previously had perplexed shipbuilders and naval architects. When one of the first of the American-built ships arrived in Britain it was reported that the propeller had been "singing." This was puzzling, because the propeller design had been produced with due regard to the avoidance of this phenomenon. It should be stated that these American ships were constructed to designs supplied from this country, and the ships were similar to other vessels building here, except that as regards auxiliary machinery and certain fittings, &c., the nearest American equivalent had to be installed. Other details had to be modified on account of the position with regard to labour and materials. Thus the vessels built in the United States are fitted with bronze propellers, while the British-built vessels have cast iron propellers.

The American ship was drydocked and the propeller was removed to the works of a local firm, where it was carefully examined by Professor W. Kerr of the Royal Technical College, Glasgow, who has carried out much research work in connection with "singing" propellers. Examination disclosed that the propeller was in accordance with the design as regards general features, but that certain streamlining at the edges of the blades was not quite as it should be. This was rectified under the supervision of Professor Kerr, and the propeller was then refitted to the ship.

Subsequent service showed that the "singing" had been cured at all conditions of loading, and similar amendment has been made to the propellers of other ships of the group which were reported as having "singing" propensities and to propellers intended for further steamers of this class.

The shipbuilding industry has had the great advantage of having at the head of the Department of Merchant Shipbuilding at the Admiralty practical shipbuilders in Sir James Lithgow, Bart., and Sir Amos Ayre. They know and have a true appreciation of what the industry can do to meet the various calls which are made upon it. One must not go too deeply into this question, but it is known, for example, that discharging facilities at some of the ports to which heavy war material such as tanks and armoured vehicles have had to be sent have not been equal to the task of unloading such heavy goods, and the ships themselves have had to be equipped accordingly.

It is also known that British locomotives have been sent abroad for service in Persia and in North Africa and other parts of the world, and these also required a special type of ocean carrier. The capacity and the resources of the shipbuilding industry have been utilised in the best manner to give the best results and the achievements are a testimony not only to the fact that the men engaged in executive and administrative work both at the Admiralty and in the industry know their job, but to the spirit of co-operation which has prevailed.

I have previously stated that although the principle of standardisation has been adopted in British ship-

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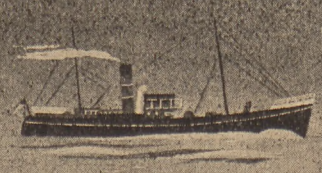

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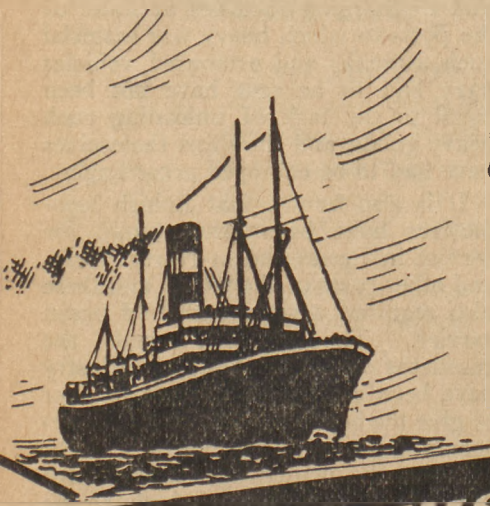

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building so far as cargo-carrying ships are concerned, all yards are not building the same standard ship. During the last war our experience with standard ships, where the specification had to be rigidly followed by each yard, proved that this was not the best method to adopt.

Early in the present war builders were asked what type of ship they could build to give the best output and, generally speaking, they are building those types. It was determined that, within certain limits of carrying capacity and performance, each yard which produced a specialised type of vessel was to build that particular type. Where yards had no specialised type they were provided with details of a suitable type which had been specialised in by another firm or developed in the course of time as the result of war experience.

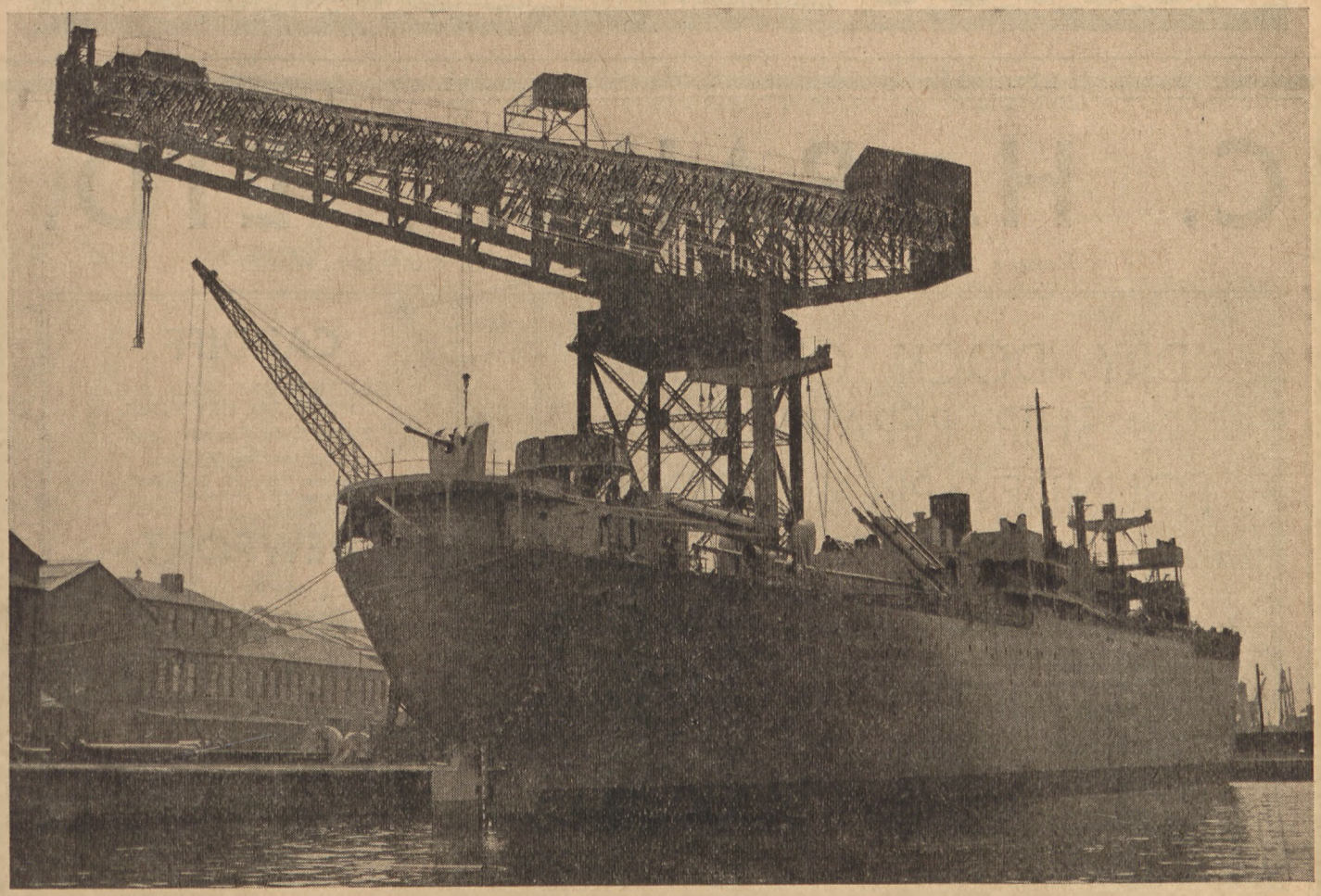
As to equipment, we know that a number of what might be considered non-essentials in wartime have been eliminated, but the cargo ship of wartime is in many respects superior to her peacetime sister. She has had to be strengthened to carry guns for defensive purposes, she has had to be fitted with degaussing apparatus against magnetic mines, and there are many other requirements to-day which are not necessary in peacetime trading.

Shipbuilding quality and workmanship, moreover, have not declined as a result of the war and the insistent demand for ships. I took the trouble to inquire into the performance of a 14,500-ton tanker which was built in one day less than eight months, from keel laying to delivery, during the winter, when weather conditions were bad and days were short—a record for this type of ship. As the Director of Merchant Shipbuilding said in a letter of congratulation to the builders, " for a vessel of this size and type, it was a most meritorious performance "; but, in achieving this result, the work was not scamped. This is what the master of the ship reported after the completion of the first round voyage :—

" The hull appears to be of sound and robust construction, little vibration was seen in either light or loaded condition except for a slight working just over the pump-room amidships when the vessel was in loaded condition and in a fairly rough sea."

He also stated that each pilot who had been on board had remarked upon the ease with which the vessel could be manoeuvred. Her steering qualities were excellent. As to loading, the arrangement of piping and valves was " very good indeed," and could easily be followed so as to render mistakes almost impossible. There was no undue tendency to go down by the head at completion of loading, the vessel finished off almost on even keel and, as to discharging, the pumps are powerful, well arranged and easy to handle and are capable of discharging 300 tons per hour. The tanks have proved easy to drain."

The chief engineer stated, rather cautiously, that " the behaviour of engines and auxiliaries was up to standard." The engine was of robust design and easy to maintain. For manoeuvring, it was ideal. As to the boilers, these had " so far " been trouble free, easy to steam and free of smoke. The oil-fuel burning system also gave complete satisfaction. " The pumping plant (cargo) was indeed ideal, handy and simple to handle." Pumps were robust and able to do their job as was proved in discharging the cargo. The speed was " quite good," and it was added that horsepower developed certainly came up to specification. It would appear that, in spite of many difficulties, workmanship of war-built British ships shows no sign of deterioration.



British pre-fabricated standard ship in the final stages of fitting-out.

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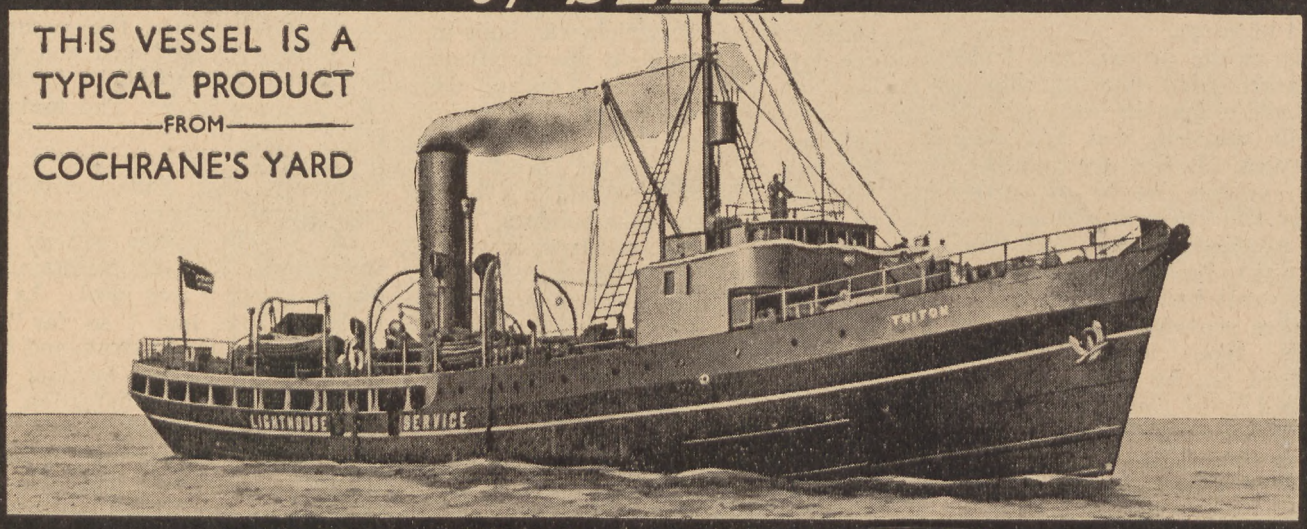

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As to naval work during the period of the war, and bearing in mind the large amount of warship repairs which have been required and the fewer workers engaged as compared with the last war, it is certainly to the credit of shipyard workers and managements that all our naval losses (at least up to the middle of October of last year) have been made good—this in spite of the vast calls made upon the Navy and the heavy losses which we suffered when our resources were stretched to the limit, as well as the other great tasks of war production which required a great proportion of our skilled manpower.

In addition to that our naval strength has been increased in some categories and, with the help of Canadian yards, a new and large fleet of corvettes has been brought into being to provide protection to our merchant shipping against the U-boat—a far more powerful menace than it was in the last war. Hundreds of various kinds of landing craft have also been built.

Since the fall of France, British losses in battleships and cruisers have been two battleships (*Barham* and *Prince of Wales*), two battle cruisers (*Hood* and *Repulse*), four aircraft-carriers (*Ark Royal, Eagle, Glorious* and *Hermes*), and a score or more cruisers. Our losses in destroyers, minesweepers and other craft have also been made good.

The two battleships which have taken the places of the *Barham* and *Prince of Wales* are the *Anson* and *Howe*. The former was built on the Tyne by Messrs. Swan, Hunter and Wigham Richardson, Ltd. She was laid down in July, 1937. Her Parsons geared turbines were supplied by the Wallsend Slipway and Engineering Co., Ltd. H.M.S. *Howe*, which was laid down a month earlier, was built and engined by the Fairfield Shipbuilding and Engineering Co., Ltd., on the Clyde.

Both are of the *King George V.* class, with a displacement of 35,000 tons, a length of 739ft. 8ins., beam of 103ft., and draft of 27ft. 8ins. The complement of each is 1,500. They carry four aircraft each and their design incorporates enhanced defence against air attack. Armament includes 10 14-in. guns, 16 5.25-in., and four multiple pom-poms. The 14-in. guns are a new model with an effective range greater than the 15.7 guns mounted in earlier ships.

When estimating the amount of labour and hard work which has been required to make good our heavy naval losses we should remember that, so far as tonnage output is concerned, a warship takes anything up to five times as many men to build as a merchant ship—ton for ton—due to many complications and the elaborate gear. If we also remember that nearly half the shipbuilding labour of the country has been employed on repair work it will be realised that after naval requirements had been met there was not available for merchant ship construction a vast reservoir of skilled labour to make good our shipping losses.

If, therefore, the output of such tonnage has been, as the Prime Minister indicated, a fourth or a fifth of the American output of eight million tons deadweight (roughly 5,600,000 tons gross) the work which has been performed by British shipyards is almost incredible and well deserves to be classed as "the eighth wonder of the world."

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U.S. Shipbuilding in 1942 Exceeds Eight Million Tons Deadweight

FOR the ships needed to assure victory, the United Nations are dependent upon the resources and facilities of the British Empire and the United States, whereas in the last struggle against Germany they had also the facilities of France, Italy and Japan, besides which other European shipbuilding countries, such as Denmark and Norway, were then neutral and able to contribute in some part to the world's needs of ocean carriers.

It is neither belittling nor overlooking the meritorious shipbuilding record of Great Britain and the Empire—the revival of the industry in Canada is alone an outstanding achievement—to state that the gearing up to a high state of productive efficiency of U.S. shipbuilding resources, old and new, material and labour, has caught the popular imagination, and the United Nations have not looked in vain to the United States for delivery of ships upon the vast scale that world-war waged with modern weapons and the incessant determined attack made by the enemy on sea communications combine to make necessary.

It is neither belittling nor overlooking the other contributions that the United States are making to aid the cause of the United Nations to state that their production of ships, whether reckoned by quantity or speed of output, is the most spectacular of all. In this respect the peoples ranged against the Axis have reason to be grateful to President Roosevelt on the one hand and the British Admiralty on the other for the measures they introduced to increase the output of ships from U.S. yards before the entry of the country into the war as a result of the treacherous attack upon Pearl Harbour just over a year ago.

The demands President Roosevelt had made on U.S. shipyards before that event were reviewed at length in the ANNUAL REVIEW a year ago; for the present it suffices to say that the President's further "directives" to the industry have speeded up the tempo and capacity again and again. It is not out of place, however, here to acknowledge the lead given by those responsible for merchant shipbuilding in this country when they placed an order for 60 ships with U.S. yards, for that order set the pace and provided the prototype of the Liberty ships that now leave the ways in America at a rate of three or four a day.

What the initial impetus thus given has meant is quickly stated. In the last war, American shipbuilding production did not reach its peak until after the cessation of hostilities. The records of Lloyd's Register of Shipping show that the peak of tonnage launched was in 1919, when coast and Lakes' yards had a combined output of 4,075,385 gross tons—that is of merchant ships of 100 tons gross and upward that were launched in 1919, whether they were completed during the year or still being fitted out at the end of it.

To-day, however, America has surpassed that achievement within a year of her entry into the war, for the figures issued by the Maritime Commission have made a total for 1942 of 8,080,000 tons deadweight—completed ships—which, expressed in gross tons, is in the region of 5,352,000 tons.

The following tabulation gives the monthly completions of merchant ships in the United States in 1942, the output for September, 1919—the record figure until May of last year—being included for comparison:—

	Ships delivered. No.	Tons d.w.
September, 1919*	—	618,886
1942		
January	16	197,628
February	26	289,549
March	26	291,473
April	36	401,632
June†	66	731,900
May	58	632,304
July	71	790,300
August	68	753,600
September‡	93	1,009,800
October	81	890,700
November	84	891,700
December	121	1,199,300
Total 1942	746	8,079,886

*Record output figure for any month up to May, 1942.
†Average of two ships a day.
‡Average of three ships a day.

The monthly production has thus averaged 62 ships and 673,320 tons deadweight, which is approximately 437,650 tons gross.

As far as the number of ships in 1942 compared with 1919 there is, of course, a big difference due to the increase in average size during the intervening period. The number which comprised the 1919 tonnage was 1,051, compared with 746 mentioned above for 1942.

Though the detailed monthly analysis of ship construction formerly issued by the American Bureau of Shipping is no longer published, yet censorship is not so strict in the United States as it is in this country in respect of shipbuilding activity, and there is considerable evidence from which to draw in giving an account of the methods by which the already remarkable output figures have been attained—and the end is not yet, as the target for 1943 is in excess of 10,000,000 tons gross.

When he addressed the 50th general meeting of the Society of Naval Architects and Marine Engineers in New York, Admiral Emory S. Land, War Shipping Administrator and chairman of the Maritime Commission, recalled that a year previously he had reported that the national emergency had pyramided the original Maritime Commission plan for the construction of 500 units for the Merchant Marine in 10 years to building approximately 1,600 units from the inception of the programme in 1937 to the end of 1943.

Since that time directives from the President had skyrocketed that production programme in the years 1942 and 1943 alone from 12,000,000 deadweight tons of merchant ships to 18,000,000, then to 24,000,000. No such challenge had ever been given American shipbuilders before, Admiral Land remarked. They were confronted immediately with an "it can't be done" chorus, led principally by "one Hitler, alias Schickelgruber, and a stoogey individual named Mussolini."

The answer of American shipbuilders to doubters is given by the figures quoted above, which show that the output of completed ships by the

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end of December was within 1,120,000 tons deadweight of the goal, and that despite the diversion of a considerable part of U.S. merchant shipbuilding capacity, for the time being at least, to construction of special types for the armed forces.

Since the inception of the Commission's original programme in 1937 and up to October 1, the Commission had ordered more than 2,800 ships of various types. Those did not include ships built on private order or the 60 "Ocean" steamers for the British Government in American shipyards; nor did they include some 800 small craft for the United Nations' use, which had been completed.

During the year, Admiral Land continued, designs had been developed and construction initiated for two large, fast-type ships, one a special naval type, and a new standardised-type cargo vessel. In some tankers, 10,000 horse-power was being installed in place of the 6,000 originally used.

The Commission had designed a vessel to replace the present Liberty ship type, which would have greater length, slightly more beam, and somewhat greater carrying capacity. It was planned also to increase the power to volume ratio which, together with a better hull form, would result in higher speed. Increased speed should be sufficient to render the Liberty ship less vulnerable to submarine attack.

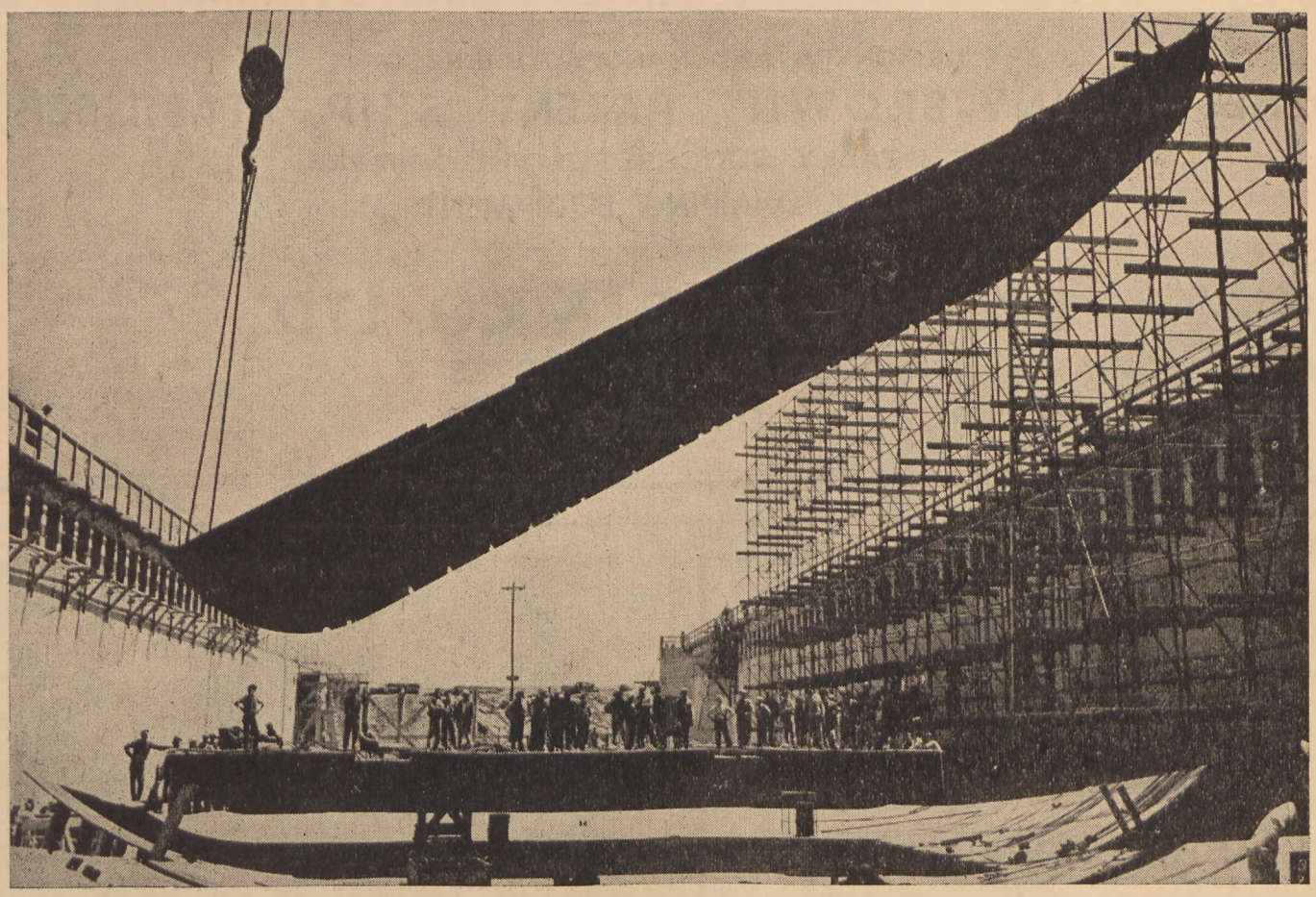
The programme of co-operation with private naval architects and shipyards had resulted in reducing the elapsed time between the preliminary design and delivery of the finished ship by almost half. Adoption of that policy together with an increasingly greater adaption of pre-fabrication and mass production methods, had resulted in the establishment of merchant shipbuilding records as astounding as they were unpredictable a year ago.

It was interesting to note that at March 1 the average time on the ways from keel-laying to launching for E.C.-2 vessels (Liberty ships) was 149 days, and the average time for fitting out from launching to delivery was 78.8 days. That average had been reduced late in October to 48.5 days on the ways and 15.9 days for outfitting, a total of 64.4 days from keel-laying to delivery. Even further reduction was expected.

Merchant shipbuilding facilities had been expanded to a point where there were more than 60 yards having in excess of 300 ways, constructing various types of vessels for the Commission. The overall expansion of facilities since the Commission came into being was more than 600 per cent. More than 800 industrial plants were engaged in production for the merchant ship programme. The total of workers in those plants and shipyards closely approached the 2,000,000 mark when Admiral Land spoke.

Spacious layout of new yards, welded construction, pre-fabrication, sub-assembly of large sections and, in the early stages, of the Maritime Commission's programme an almost unlimited supply of labour, intelligent and adaptable though unskilled, large capacity cranes to move into place on the ways the large welded sub-assemblies . . . . these are some of the methods which have made possible America's shipbuilding achievements.

In the newly-built shipyards everything has been done to streamline production methods, with the result that those yards, especially designed for the purpose of building ships for the Liberty Fleet, are making speed records from keel-laying to delivery into service.



Double-bottom section, weighing 62 tons, for an American merchant ship.

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Notable among the changes in former practices have been new methods in connection with the actual construction of ships; standardisation of designs; decentralisation of inspection authority; short cuts in order to speed production; new methods of training skilled labour and expansion of training systems; and changes in shipyard management for purposes of speed.

Welding has made possible the pre-assembly of large sections of ships in the shops, such as bow sections and deck-house sections. Pre-fabrication of these assemblies in shops lessens the time a ship is on the building ways, thereby releasing the ways for another ship. Such an arrangement is regarded as highly important, particularly where facilities are limited, but of paramount importance when the fast delivery of vessels is imperative.

When the pre-fabricated sections of ships are put in place they are absolutely complete in every detail. The deck-house, for example, has the wiring, piping, voice tube, and everything else, even to the electric lights, installed before being set down on the deck. The remaining work is merely a matter of welding the section into place. The same holds true of bow and other sections.

Overcrowded working conditions of the shipyard worker are relieved by the practice of pre-fabricating large sections. Workmen crowded into a comparatively small space (there are about 5,000 on a ship of any size) are hampered on the shipbuilding ways. They get in one another's way. Under the pre-fabrication method, however, the same men work on the ship, but they are spread throughout the yard.

It has been possible for most of the new shipyards constructed especially to meet the shipbuilding demands of the emergency to adopt the pre-assembly plans to a larger extent than some of the old-established shipyards. The layout of the new yards was specifically designed to use the new techniques.

The new yards were equipped with heavy weight - handling equipment adequate to lift the large assemblies. The older yards, however, already had their equipment, and unfortunately it was not designed for lifting such heavy weights.

A great deal depends upon the crane capacity. When the new building programmes started, shipyards were handling 30 to 40-ton pieces with 25 to 30-ton cranes. In the new shipyards 40-ton cranes were installed and with two of these 80-ton sections can be installed in the ship. One of the new West Coast yards has a crane of 270 tons' capacity.

Pre-fabrication of heavy sections for shipyards equipped with the heavy weight-handling cranes has been carried so far that whole sections are being built far inland. For Pacific Coast shipyards these sections are being built as far inland as Colorado and then shipped to the West Coast for assembly, while pre-fabrication work is done in the Pittsburgh area, on sections to be assembled at Atlantic Coast shipyards.

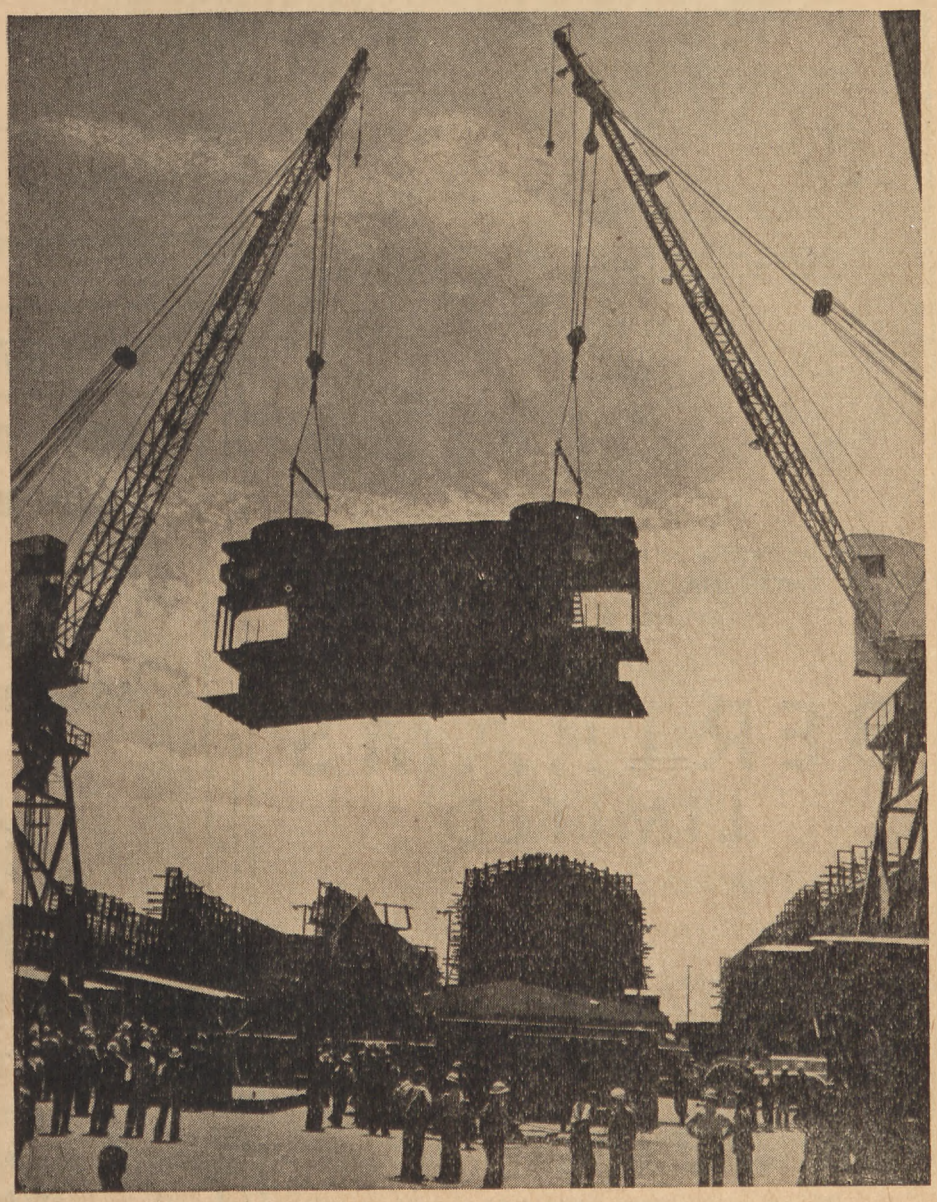
Standardisation of designs is another factor which has contributed in large measure to the speeding up of the ship construction output. The standardisation was made by the contracting agencies of the Government—the Navy and the Maritime Commission. To it is attributed the success of the Liberty ship programme.

It is true, of course, that merchant ship adapt themselves more readily to mass production than combatant ships, but a great deal of time has been saved even in Navy ships through design, standardisation and repeating of types.

Another newly adopted measure contributing to the speeding up process is the decision of the two governmental agencies to decentralise a lot of authority for decisions and approval of plans, and to vest some of it in local inspectors in the field.

Shipbuilding companies for years attempted to have the Government contracting agencies adopt both standardisation of design and decentralisation of inspection, but it was not until the war emergency that governmental agencies determined that the moves would assist in speeding up production.

Another contribution to the speedy completion of the ships made by standardised designs is by making possible interchangeability of main machinery and auxiliary installations. This permits of large scale buying. The



Pre-fabricated deckhouse being lifted on board a new ship at a Kaiser yard.

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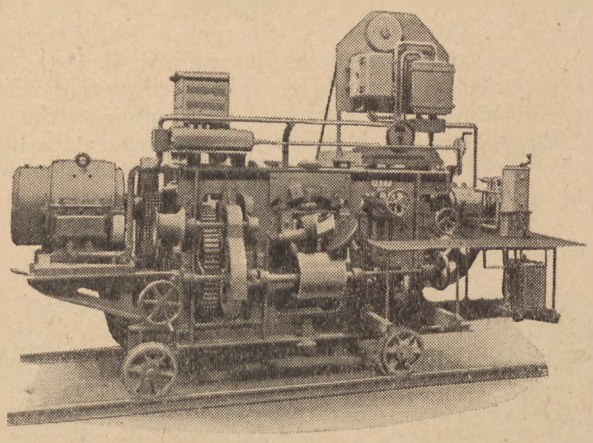

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results are the saving of time, a better ability to plan the work, and the saving of considerable money.

In shipbuilding, as in nearly all other war industries, welding and its related processes are playing a vital and indispensable role. Without these processes to take the place of heavy machine tools, it would have been impossible to turn out ships and other war products at the tremendous rate of production which must be realised to win the war.

Welding has now become the normal method for shipbuilding, with not only increased speed of construction but a saving of 13 to 20 per cent. in weight of steel, a most important strategic material. This saving of weight provides additional deadweight carrying capacity.

Other advantages afforded by welding are superior oil and watertightness, easier cleaning, painting and maintenance, and more rapid and cheaper repairs, as well as less sustained damage to vessels under shellfire and less danger to personnel.

During the last war arc welding, still in its infancy, and oxy-acetylene welding also were of rather minor importance in shipbuilding, although oxy-acetylene cutting played quite an important part, especially in repair work. To-day very few parts of American ships are riveted and many shipyards are building entirely welded vessels, including both merchant and warships.

Ships are now being built in less than one-fifth the time it took during the last war, and their efficient operation and performance have already been demonstrated in carrying cargoes of war materials thousands of miles

The mass production method of shipbuilding differs in general principles from that employed in the automobile industry. In only a comparatively few cases of the building of rather small vessels within restricted working and launching areas, and in one or two projected layouts for building fairly large ships does the production involve the moving of the hull itself along progressively during stages of construction, in the typical assembly line method of production.

Most shipbuilders have deemed it impracticable to move continually a heavy structure like a ship in this manner. Instead, the sub-assemblies are moved to the ship for erection while the hull remains on the building way or moored in a fitting-out berth.

Under the circumstances of a programme expanded to proportions never before even dreamed of in shipbuilding, the general organisation of production has naturally been vastly different from previous practices, and it has had to be carried out largely by men with no previous experience in shipbuilding. The drafting of key men from existing shipyard staffs, however, has formed a nucleus of men experienced in details peculiar to modern welded shipbuilding, so there has been no lag in progress at any time.

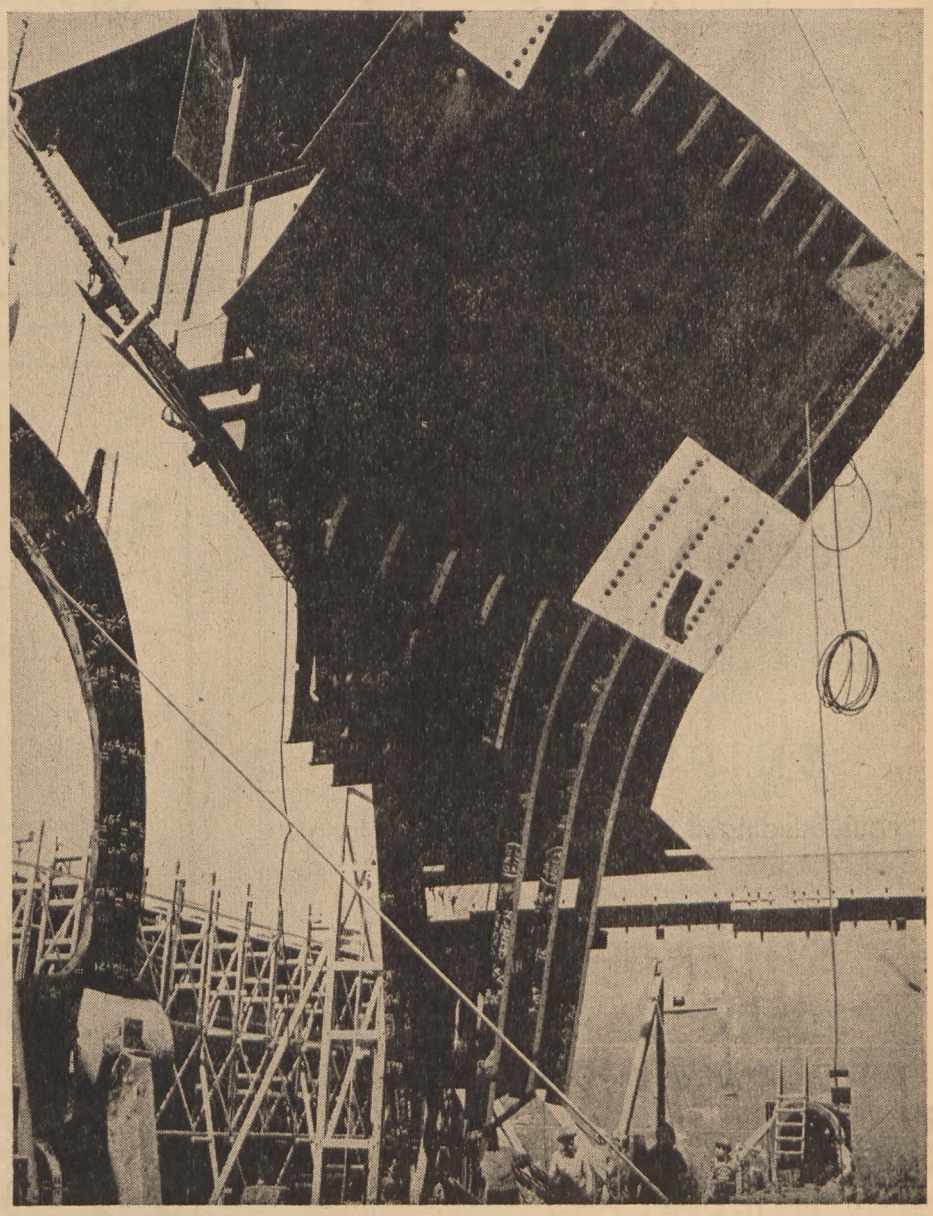
Methods of construction, other than by welding, might have been adapted, after a measure, to the sub-assembly or mass production type of ship construction, which is largely responsible for the increased speed of to-day. However, this would have involved delay and greatly increased capital investment, as well as increased production costs.

Aside from the proving of extra fabricating machinery and equipment, riveted sub-assemblies must be constructed on elevated working platforms to permit additional workmen to drive rivets from the underside, whereas welding requires access to only the upperside.

As welding entered the picture of shipbuilding as a new process, over a period of quite a number of years, it was found that its efficient use required extensive revisions in methods of construction as well as in design.

Welding is much faster and easier when the work is lying flat and the welds are made on the top surface than when the operator has to reach up overhead or weld on a vertical surface. This naturally led to the pre-assembling on the ground of large sections of decks, bulkheads and side shell plating with beams, stiffeners and side frames welded to the plating before erection on the ship.

Since there is a limited number of



After-peak section of Liberty ship being lowered into position.

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men who can work efficiently at one time on a structure like a ship, the most effective means of speeding up production is to get as much work done as possible before the parts of the ship are erected on the building ways.

Welded sub-assemblies commonly include inner bottom sections to be erected later on the bottom shell; also large bow and stern sub-assemblies and other three-dimensional sub-assemblies such as deck houses to form the superstructure of the ship above the main or weather deck.

This method naturally requires much more working space. Large areas are provided with skids, tables, or steel plate working floors, sometimes referred to as "platens," for laying out the work and welding it together into sub-assemblies, after the plating and steel shapes have been trimmed or cut to proper size by oxy-acetylene cutting torches and machines, and have been rolled, bent or flanged where required. Some further trimming is also done rapidly with the oxy-acetylene torch after sub-assemblies have been completed or when they are fit, regulated and lined on the ship.

Some of the older shipyards are handicapped by lack of space, under new methods. To remedy this, many items which used to be constructed or assembled entirely in the shipyards are now produced elsewhere. Welding is used for the production of most of these items. Some shipbuilders fabricate welded bulkheads, machinery foundations, hatch covers, bracing, floors and intercostals for double bottoms, and various other weldments, as far away as 300 miles from the shipyard, where facilities were already available.

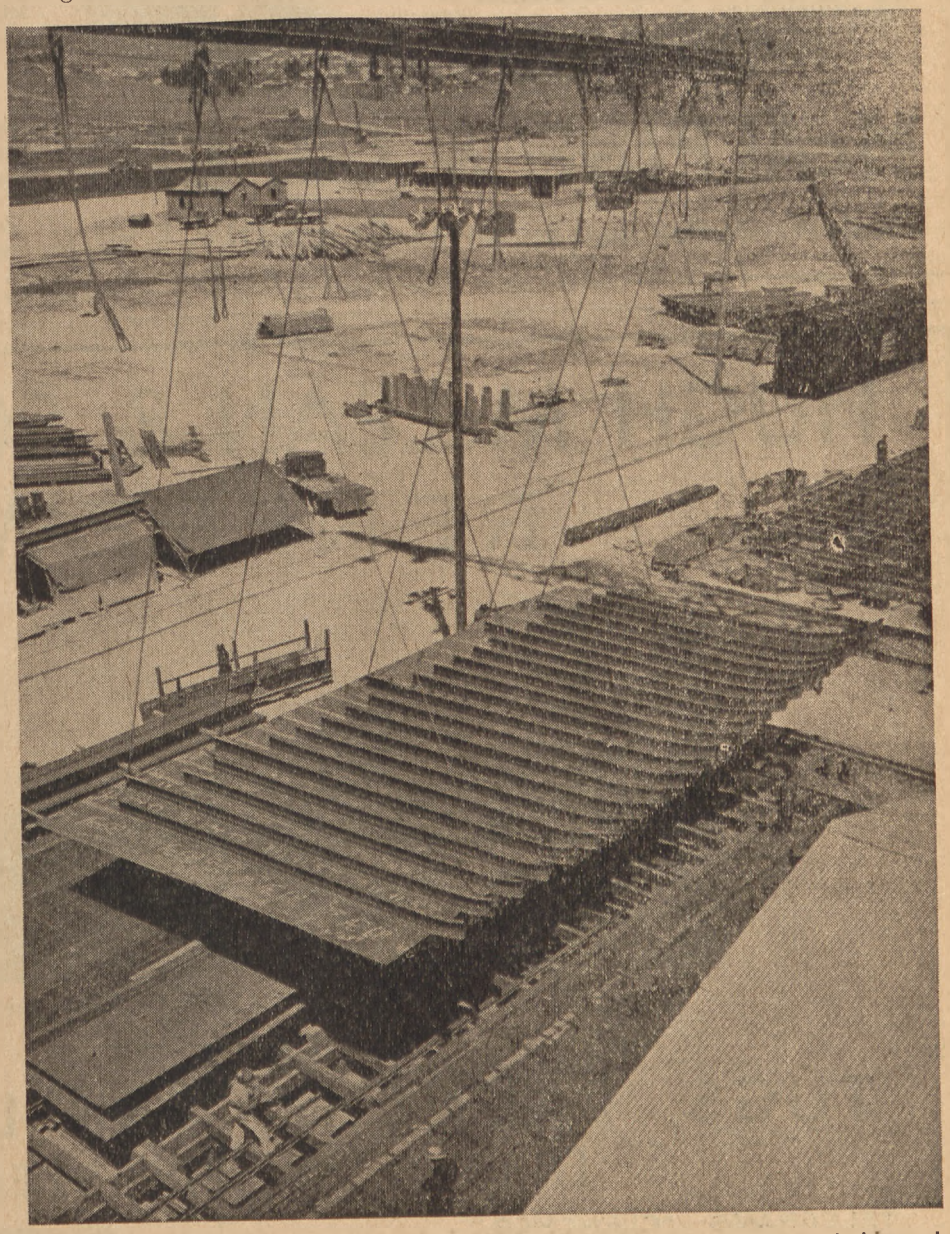
Observations on American shipbuilding practice as viewed by British experts were included in the 11th Andrew Laing Lecture read recently before the North East Coast Institution of Engineers and Shipbuilders by Messrs. R. Cyril Thompson, C.B.E., M.A., managing director of Messrs. Joseph L. Thompson and Sons, Ltd., and Harry Hunter, O.B.E., B.Sc., technical director of the North Eastern Marine Engineering Co. (1938) Ltd.

The title of the lecture was "The British Merchant Shipbuilding Programme in North America, 1940-42," and the joint authors were respectively head and marine engineer member of the technical merchant shipbuilding mission which was appointed by the Admiralty in 1940 with the object of obtaining, at the earliest possible moment, the delivery of merchant tonnage at the rate per annum of about 60 ships of the tramp type of about 10,000 tons deadweight from U.S. yards. The mission was also given authority to investigate the possibilities of merchant shipbuilding in Canada.

As is generally known, contracts were signed on December 20, 1940, with Todd-Bath Iron Shipbuilding Corporation, Portland, Me., and Todd-California Shipbuilding Corporation, Richmond, Cal., covering the building of two shipyards and 30 ships at each yard. Shortly afterwards orders for 26 ships were placed with Canadian yards.

In the course of the lecture, the authors observed that labour was available in quantity—there were 12,000,000 unemployed in the U.S.A. at the beginning of the war—having a high average of intelligence and mechanical aptitude with a large proportion of skilled craftsmen among them, although practically none had previous shipbuilding experience. Also, the yards were laid out for, and engaged on, repetition of the identical ship in quantity so that men were largely on the same job time after time—an essential to the efficient and quick utilisation of raw labour. With this went an elaborate system of production planning including very complete breakdown of the plans into component details.

Under such conditions a man without previous experience, but with aptitude, very quickly becomes an efficient worker; in the Richmond yard, early in 1942, when that yard was one of the leaders in rapid building and in economy of man-hours per hull, the total number of employes was about 10,000, of whom 87 per cent. had no experience in shipyards. About 7 per cent. were classed as trainees and 20 to 25 per cent. as helpers.



Large pre-assembled section being placed in position at a U.S. West Coast shipyard.

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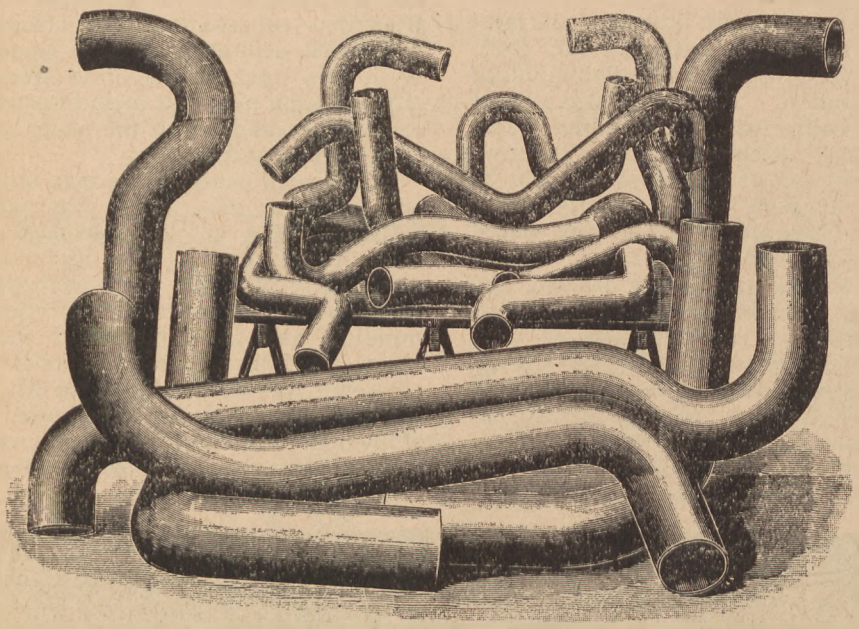

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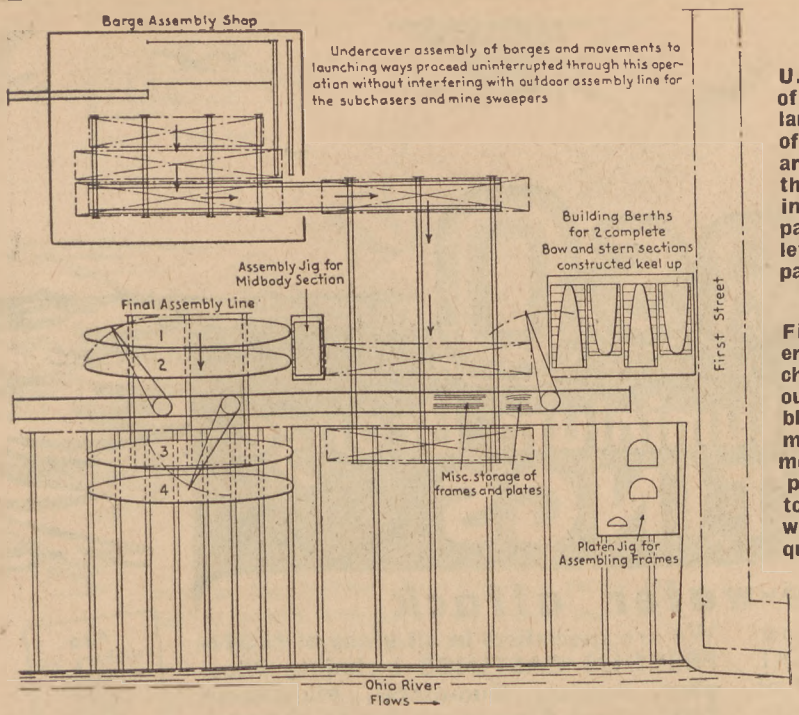

U.S. methods of constructing large numbers of small craft are indicated in the two drawings on this page and in the letterpress on page 227.

Fig. 1 — Final erection of subchasers on new outdoor assembly line permitted maximum production proportionate to launching way space required.

Of about 1,100 welders employed, 650 had been trained in the yard, and also large numbers of yard trained men had transferred to associated yards. In this connection it may be noted that the first keel was laid in April, 1941, and the first launch took place in August, 1941, and 30 ships were launched by June, 1942.

Other U.S. yards had even higher percentages of men with no previous experience, and in the case of one large 11-berth yard which has set up some recent remarkable building records, the percentage of men with no previous shipyard experience is believed to be over 95. This particular yard launched its first ship in September, 1941, and 54 by August, 1942, and the authors recall that the production planning set up was one of the most complete in the U.S.

Beginning with the loft, it was found that mould lofts generally were very much larger than in this country. Special care was taken with the design of the mould-loft floors to avoid expansion and contraction due to temperature changes and this was usually done by laying the usual wood floor strongly constructed and on top of this wood floor a hardwood parquet floor. This hardwood floor was polished and the lines were marked out in pencil instead of the usual method of a black floor and chalk lines. The object of this was to ensure absolute accuracy because from this floor templates were made covering every individual part of the ship. Templates were made of specially seasoned timber, and in some cases of special paper, while in other cases of sheet metal.

The next process was to cut the various plates and sections correct to shape and this was nearly always done by oxy-acetylene flame cutting. Many different and elaborate types of flame-cutting apparatus were in use, one of the most notable refinements being the mounting of the burners on floating heads so that the distance of the burner from the plate was automatically adjusted and consequently plates did not have to be perfectly flat before burning. The bevelling required to suit welding was usually done in the same manner and at the same time as the cutting process.

Flanging machines were usually installed; also, the usual shell rolls. Other special machines were provided for the shaping of plates. In this connection, although we built similar ships without furnacing any plates at all, in America they find it easier to make special moulds and furnace or press any plate having an undue amount of shape, thus avoiding the rather specially skilled occupation of rolling plates having a double set, and also ensuring absolute accuracy of the shape of the plates and simplifying the fitting of them into welded structure.

Frames were turned in exactly the same manner as here, the furnaces usually being oil fired.

It will be seen, therefore, that very little normal shipyard machinery was used and the whole of what might be called the skilled operation of shipbuilding was really done in the loft.

The next process was the erecting of the various plates and sections into sub-assemblies, which might weigh anything up to about 50 tons, and in some of the yards now very much heavier weights can be handled. These sub-assemblies were designed to avoid turning over as much as possible during the welding operation, which is carried out on skids on the ground.

The intention was that enough space should be allowed so that all the sub-assemblies required in the ship could be ready before the berth was vacant, and in this connection it has been found that in the original British yards in the U.S.A. the space allowed for storing the sub-assemblies was not nearly sufficient in relation to the very high speeds of production which are now being obtained.

Such speeds, however, were not contemplated at that time and the original design of the Richmond and Portland Yards contemplated an output of 30 ships per annum whereas actually it appears that the capacity

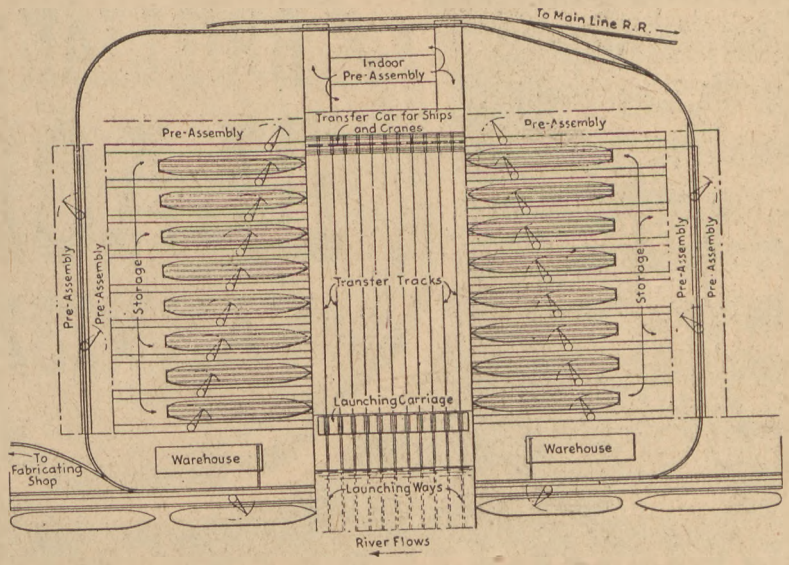

Fig. 2—This yard, while embodying the principles of assembly line methods, permits the movement of any vessel, from its erection site directly to the launching ways.

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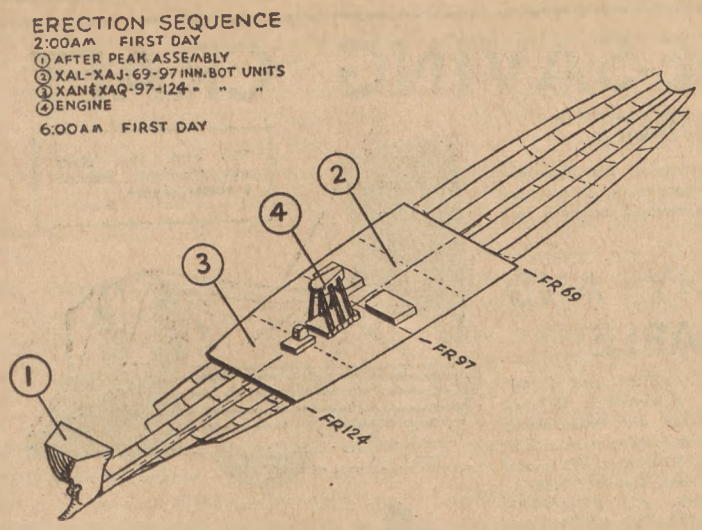
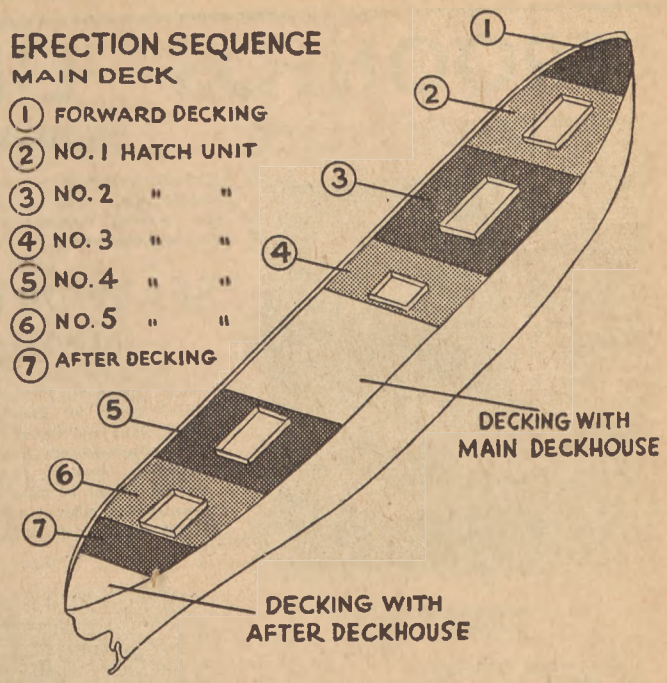
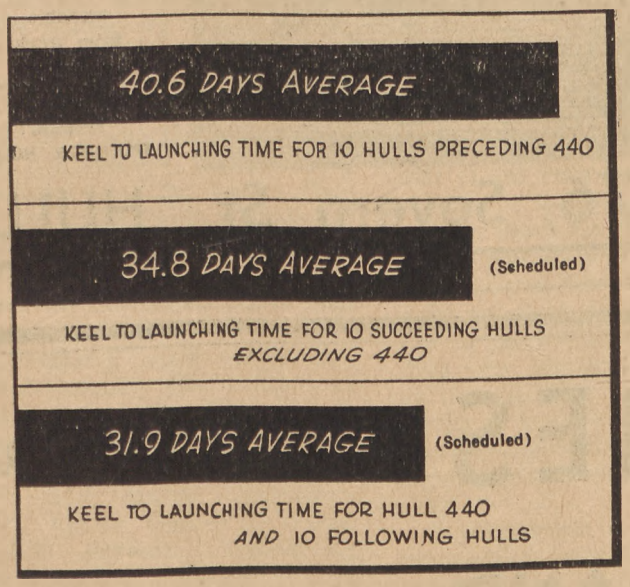
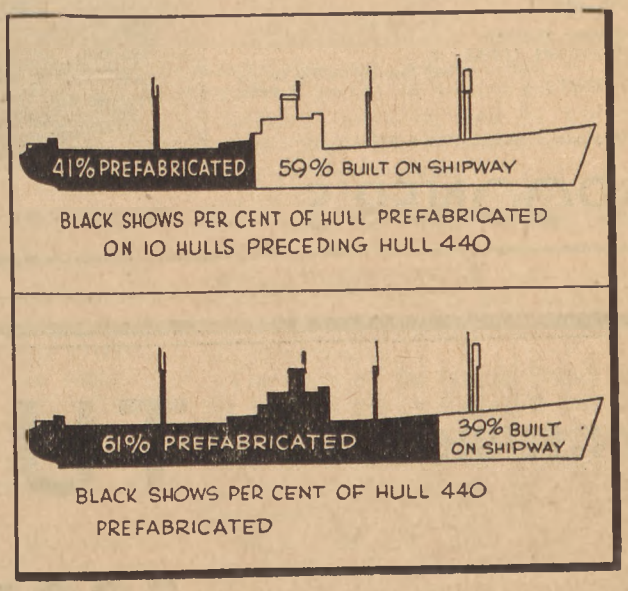




Data in the accompanying drawings relate to the Richmond Shipyards' No. 440, launched in under five days from keel laying.





of the Richmond Yard is nearly three times, and the Portland Yard nearly twice, the number of vessels originally contemplated. When the berth became vacant the sub-assemblies were then transported and erected in the berth in accordance with a sequence plan and chart.

Alternatives naturally developed as experience was gained, and the following comments on the alternatives may be of interest, although most of these developments took place too late for adoption in the British contracts :—

Originally the bottom shell was arranged to be laid out plate by plate in the berth and machine welded on top, hand overhead welding being adopted underneath. Later, sections were laid out on the skids about 60ft. long, and these sections were then turned over to enable machine welding to be done on both sides.

The sections were then assembled in the berth and the joints machine welded on top and welded overhead underneath. This enabled more work to be done before a berth was vacant. Floors in sections already welded to the tank top on the skids were then put in place. This remained general practice.

Pre-fabricated bulkheads and side shell bolted to frames up to second deck were next erected. Later, sections of side shell were riveted to the frames on the ground before erection and to enable this to be done the original staggered shell butts were re-arranged so that welded butts in line were adopted. The authors said they were rather nervous about having butts in line, but experience did not seem to have justified their feelings.

Hatch-end beams and girders were next erected followed by sections of second deck already welded to beam. Later, both hatch beams and hatch side girders were welded to sections of deck plating and beams on the ground and lifted into place as units with butts in line with hatch and casing corners. Side shell was next pulled in and faired to the decks and welded thereto and the frame feet brackets welded to tank top.

'Tween deck bulkheads and 'tween deck frames already riveted to the sheer strake in sections about 60ft. long were next erected followed by upper deck hatch-end beams and girders and sections of deck. The same development took place as regards the attachment of upper-deck hatch-end beams and girders to sections of deck as in the case of the

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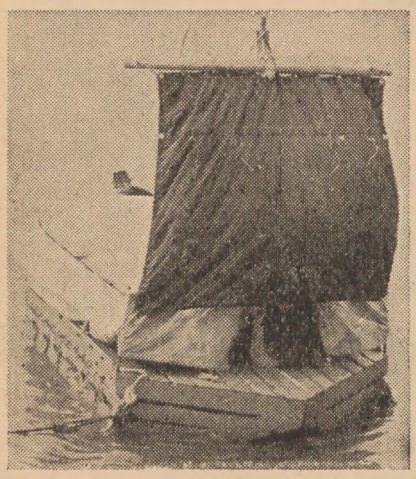

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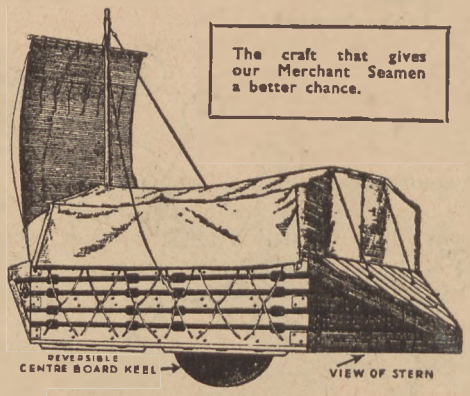

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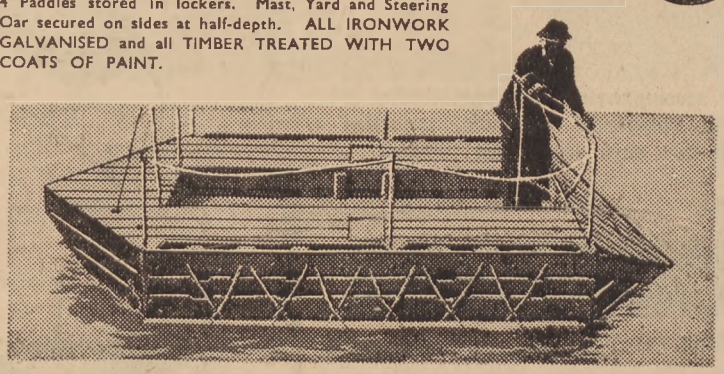

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second deck. Stringer butts were, however, generally kept well clear of the grouped shell and deck butts. Top side shell was then pulled in and welded to upper deck, 'tween-deck frame feet welded, and the ship was then ready for the erection of deckhouses, which were generally prefabricated entirely as units on the ground.

The ends of the ship, i.e., from fore-peak bulkhead forward and from after peak bulkhead aft, were laid out and built up as pre-assemblies on the ground, the cruiser stern also being made as a separate unit on the ground and the whole of these units were transported complete to the berths. Between these end assemblies and the main midship body, however, an appreciable amount of material was assembled in the berth in the form of individual plates and frames as far as the shell was concerned.

The method described above involved the lifting of weights up to about 50 tons, and these weights were generally handled by two cranes of 25-35 tons' capacity.

In accordance with the U.S. custom main engines, boilers and shafting were installed on the berth, thus enabling the decks to be closed and work amidships to proceed before launching.

It has been mentioned above that only in a comparatively few cases of building relatively small vessels can the typical assembly line method of production be employed. One example of this method was described in a paper read before the Society of Naval Architects and Marine Engineers, New York, by Mr. George F. Wolfe, chief plant engineer, engineering works division, Dravo Corporation, in which he outlined the building of submarine chasers by production line welding plant.

Mr. Wolfe said that the first attempt to adapt the principle to ship construction was made at the Neville Island plant of Dravo Corporation in 1936. Vessels were erected in positions inboard of the crane tracks and were moved over into the launching position on concrete-filled pipe rollers. This was an experimental step and the advantages were so apparent that plans were placed under way after a short trial period which resulted in the building of the first indoor barge assembly plant.

This indoor plant, which is shown in the upper left-hand corner in Fig. 1, was successful from the beginning and soon demonstrated the many advantages of applying production methods to ship construction. With the advent of increased production necessitated by the defence programme and the requirement for rapid expansion of shipbuilding facilities, additional assembly lines appeared to be the proper answer.

The first requirement was the building of a number of Navy vessels and assembly lines were set up for this purpose at yards in Wilmington, Del., and Stockton, Cal. Remarkable speed was obtained on these lines and the deliveries of the vessels were most satisfactory. Some of these vessels were sublet to an established west coast builder but Dravo was able to build an entirely new yard incorporating an assembly line and complete a larger quota in less time than the subcontractor required using conventional methods.

A second project soon followed the first Navy order and a general survey of yard requirements indicated that additional lines would have to be added at both the Neville Island and Wilmington yards, if private contracts were to be completed together with the rapidly growing demand for Navy equipment. The schedule of deliveries for the vessels previously discussed required a minimum of four building berths, which would have required half of the entire building area available on the launching ways.

With the barge shop already in service it was considered most desirable to keep the flow of vessels from it quite uninterrupted, so a new assembly line as shown in Fig. 1 was erected. This new line permitted the securing of the requisite number of building berths at a minimum of expense and delay and offered no obstruction to the regular flow of vessels from the barge shop.

A comparison of the yard without production assembly lines with the revised yard shows a tremendous increase in working area without any increase in the river frontage or in the required equipment.

In making provision for the new assembly line for the subchasers no new crane equipment was necessary and the short assembly tracks were put in at small expense. At this part of the yard the launching ways were on close centre and only two new ways had to be added.

Conditions similar to these had likewise been developing at the Wilmington yard, where the congestion was even greater. The first assembly line was put in service at Wilmington late in 1940 and it was followed by another line built late in 1941. The maximum capacity of this yard on the basis of work now under contract but with the addition of assembly lines has more than doubled in terms of actual structural tonnage in place on the building berths.

With the addition of the assembly lines there has been some increase in other facilities, but these are of rather limited extent. A second crane track with two gantry whirler cranes was added, as well as a new railroad siding. No other changes in the yard were required, so the proportionate increase in the capacity of the yard was far ahead of the increased investment.

At the time of these improvements the yard was occupying all of the river frontage then available and the use of the assembly lines was the only practical method to improve the capacity without a major expenditure. The more than doubled capacity was therefore obtained at an increase in cost of less than 50 per cent. of the cost of the yard as shown in the original state.

The operation of such concentrated work is likewise carried out at lesser cost than where the work is spread out over a much greater area. Careful attention must be given to the planning of both the shop pre-assemblies and the erection at the building berths to insure a carefully scheduled operation and to prevent undue congestion of material at any point in the system.

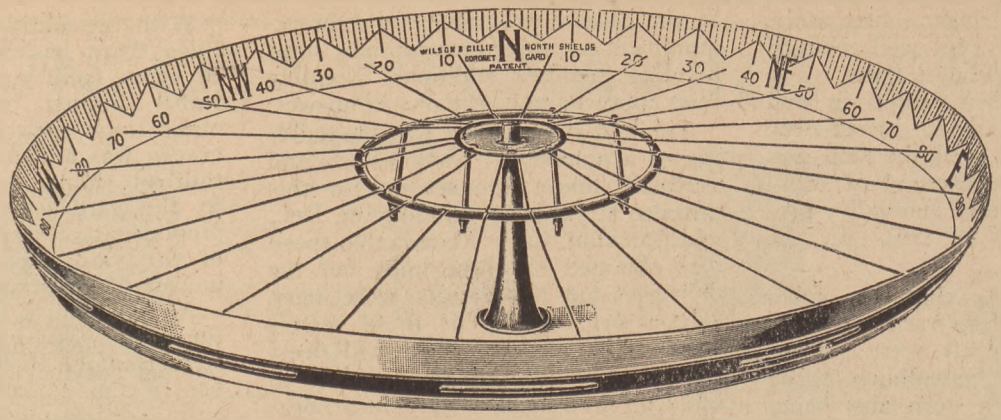
The movement of the vessels on the production lines permits the various groups of labour to be constantly engaged on the same operation with a resultant high efficiency both in quality of product and economy of performance.

The entry of the United States into the war put new and greater demands on the shipbuilding yards which, Mr. Wolfe said, would be met in large part by the introduction of the assembly line methods on a much larger scale.

All of the new yards under construction are based upon the principle of erecting the vessels in positions most favourable for efficient production according to the sites available and all follow the idea of moving the ships to a single set of launching ways.

Different installations have been designed to meet special conditions which are largely dictated by the chosen sites and the desired results. Various handling facilities are used, and there is a great flexibility in the combinations of assembly lines and crane equipment.

Several months prior to the declaration of war, Mr. Wolfe had occasion to develop a special type of assembly lines, as shown in Fig. 2. In this case it was found desirable to make provision for the transportation of the vessels from any erection berth directly to the launching ways. This precaution was to safeguard against delay in the event that machinery for any individual vessel might fall behind the delivery schedule.



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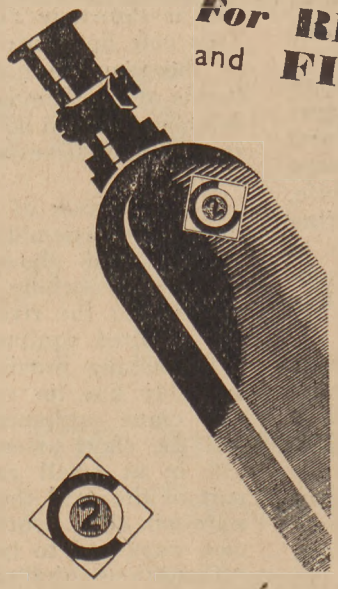

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In this case 16 berths were so arranged that each one could feed directly to a transfer car for movement of the ship to the launching ways. By providing one large transfer car for the movement to the launching ways it was also possible to lay crane tracks on this transfer car and use it for the movement of cranes from one track to any other in order to concentrate crane power for unusually heavy lifts.

As a fitting conclusion, reference may well be made to the achievements of the Kaiser group as illustrative of the spectacular and effective manner in which America has " swung into high gear " in order to provide the ships required by the United Nations to accomplish the defeat of the Axis powers.

In the ANNUAL REVIEW a year ago, it was mentioned that Mr. Henry J. Kaiser was to be president of the new Todd-California Shipbuilding Corporation at Richmond, Cal., where 30 ships were to be built for Britain. In the intervening twelve months, it is probable that the name of Mr. Kaiser has become better known to the general public than that of any other shipbuilder by reason of the progressive reduction his yards have achieved in the time necessary to assemble and complete the Liberty ships which form the main part of the U.S. merchant shipbuilding programme and by reason of the schemes he has submitted to the U.S. authorities for the construction of a large fleet of cargo-carrying aircraft.

It has been recorded that Mr. Kaiser never thought about building ships until after the outbreak of war in September, 1939. He took 30,000 men—most of whom, like himself, never had worked on a ship—and formed them into a production unit in less than 12 months.

Mr. Kaiser's experts have studied the Liberty ship from stem to stern for production speed, and have developed pre-assembly to a point unparalleled in other yards. The Kaiser men came into shipbuilding with a full knowledge of production methods but with little about shipbuilding. They had no preconceived notions about ship construction; no traditions, no prejudices to overcome. They just figured out the fastest way to put them together and did it.

It is a Kaiser tradition that no man in the outfit ever admits that a thing cannot be done. Whenever a sceptical ship man said, " That cannot be done," Mr. Kaiser or one of his assistants replied, " Okay, we will get a construction man in here, and he will do it."

Mr. Kaiser had previously established a reputation in civil engineering—particularly the construction of big dams—and in the Andrew Laing Lecture mentioned above it was pointed out that his group of Pacific Coast civil engineering contractors were just completing the big Grand Coulee Dam contract when they entered upon merchant shipbuilding and were able to bring in a highly efficient team well experienced in the handling of bigger contracts than the traditional shipbuilder. In the result the Kaiser group have not only built 30 British ships in record time but have set up several other yards, all of which are doing equally well, and " they can claim to have set a high standard to the world in the mass production of good ships." That comment epitomises the American contribution to the Merchant Navy Power of the United Nations.

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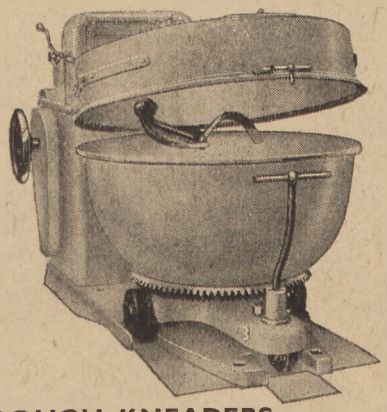

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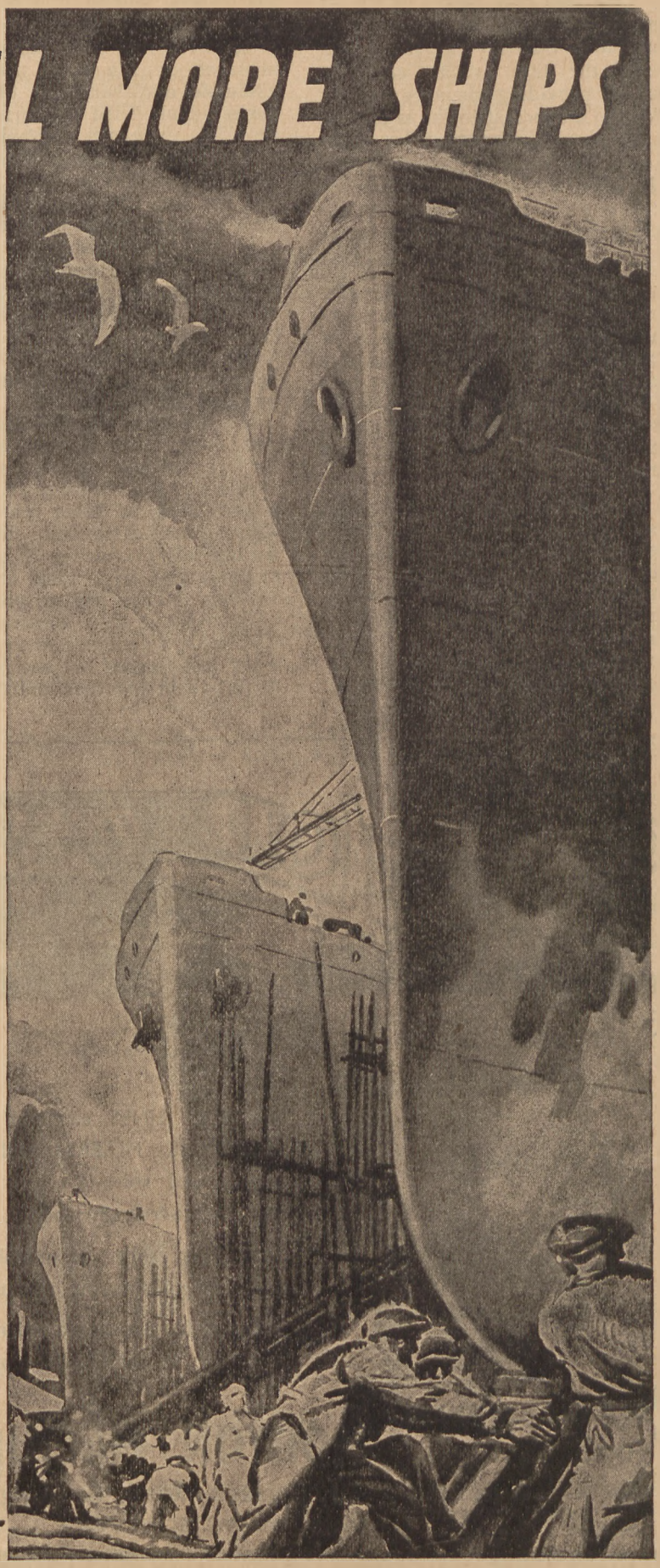

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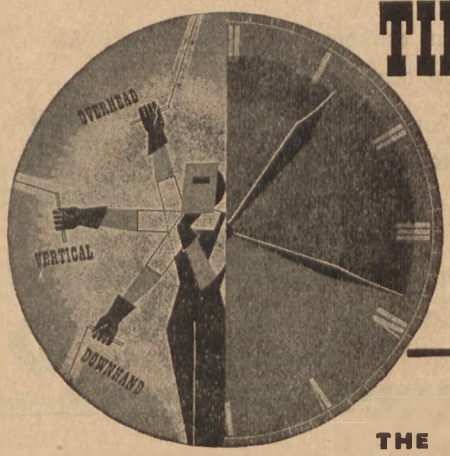

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A Symposium on

The APPLICATION of WELDING to SHIP CONSTRUCTION and REPAIRING

DUE in part to progress in the United States, where the Liberty ships are of mainly welded construction, increasing interest is being shown in this country in the application of welding to shipbuilding and shiprepairing. In the following pages there is accordingly published a symposium of articles on the subject to which different firms have contributed.

For the introduction to the symposium, we are indebted to Dr. James Montgomerie, Chief Ship Surveyor of Lloyd's Register of Shipping for his review of the development of welding in this country, with special reference to the provisions made in that society's rules for the introduction of the new methods. It will, of course, be appreciated that Dr. Montgomerie is not associated in any way with the articles which follow his introduction and that the statements made in them are those of the respective firms named in the headings.

WHAT HAS BEEN AND IS BEING DONE

By JAMES MONTGOMERIE, C.B.E., D,Sc.
Chief Ship Surveyor, Lloyd's Register of Shipping.

THE possibility of electric welding was first demonstrated about 50 years ago, but the first case recorded by Lloyd's Register of Shipping was the repair of a combustion chamber in a boiler in 1906. The first application to a hull was a repair to the lower part of a cast steel sternframe in 1907; on first examination this repair was found to be sound, but about a year later the sternframe was found cracked some inches above the weld and renewed.

By 1911 about 160 cases of repairs to boilers and 20 to hulls had been reported, the boiler cases being largely confined to welding up cracks and repairing wasted patches of seams and furnaces and combustion chambers, while the hull cases related principally to filling in flaws and cracks in rudders and sternframes. After 1911 the use of welding for effecting repairs was very largely extended, and in 1917 this process was utilised in about 140 cases to boilers and 14 to hulls, the latter as before principally to rudders and sternframes. In addition, there were, of course, a very large number of minor repairs. The repairs so carried out were in general effective, but the relatively small number which proved unsatisfactory created a certain amount of scepticism regarding the value of welding.

The electrodes used in these early days were either bare wire or coated with a thin paste, the primary object of the latter being to cause the metal to run more smoothly while being deposited.

The last war saw the introduction of the heavily coated electrode in which, by suitably varying the constituents of the cover, an effort was made to control the composition of the deposited material and to provide a light slag covering which would protect the metal from contamination by the air during the process of cooling.

By the end of 1917 such progress had been made as justified the committee of Lloyd's Register in embarking on a series of tests to investigate the possibility of applying welding to the construction of new ships. The experiments, the first to be carried out on an extensive and systematic scale, were designed to obtain information rgarding the tensile strength, ductility and resistance to alternating stress of welded joints. The results of the tests showed that fracture of the specimens took place clear of the welds, that ability of welded joints to resist fatigue was about 60 per cent. that of the parent metal and that butt welds failed at about 50 degs. under a bend test as compared with 180 degs. for steel. The deposited material possessed high ultimate strength, but the elongation was only about 10 per cent. as compared with 20 per cent. for steel. In short, it may be said that the results showed that joints made by electric welding had ample strength but were decidedly deficient in ductility.

Following these experiments Lloyd's Register adopted in 1918 tentative rules for the application of arc welding to ship construction with the proviso that until experience had been obtained with welded vessels in service, they should be classed "experimental."

The first all-welded ship to be built was the *Fullagar*, a coasting vessel of dimensions 150ft. by 23ft. 6ins. by 11ft. 6ins., constructed by Messrs. Cammell Laird and Co., Ltd., in 1920. The construction of this ship constituted a valid, full scale experiment in electric welding, as no rivets whatever were used in the construction. During her life, which ended in sinking, due to collision in 1937, she was engaged in heavy trades, carrying steel plates from South Wales to Liverpool and later cargoes of cement in coasting service in British Columbia and on several occasions received severe damage, but the welded connections at all times proved quite efficient. Subsequent progress in the application of welding was steady but slow, being confined to internal structure, bulkheads, non-strength decks and items of a similar nature.

In 1932 on a general review of the position it was agreed that experience up to that time had been satisfactory, and that the use of welding might well be extended. The feature to which

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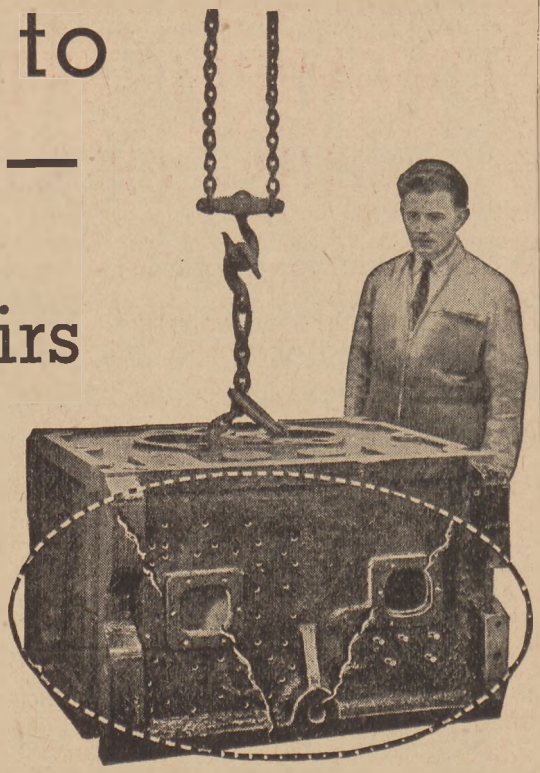

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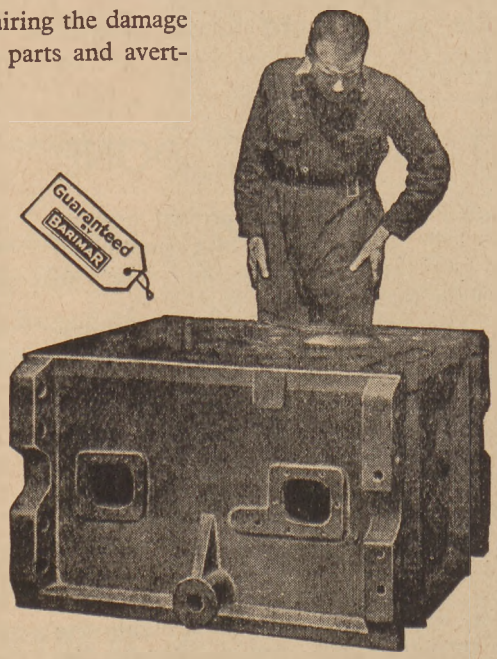

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THE WORLD'S SCIENTIFIC WELDERS

was due the reluctance to weld the principal structural members of ships was largely distrust of welding on account of its lack of ductility. The electrode manufacturers had, however, not been idle and by this date electrodes could be obtained which would deposit material having an elongation of 16 to 18 per cent. as compared with from 2 to 12 per cent. in earlier years. In Germany faith was placed in bare wire electrodes having an elongation of only 2½ to 7½ per cent.

Having in view the improved grades of electrodes then obtainable, Lloyd's Register in 1932 issued revised rules for electric welding, the principal alteration being that for electrodes intended to be used for parts of the vessel of primary structural importance a definite standard of ductility was required, this to be demonstrated by bend, elongation and impact tests. It was also felt that experience had justified the omission of the qualification of "experimental" in the class of welded vessels, and this concession was undoubtedly a factor in the rapid expansion in the use of welding which dates from this time.

In 1933 a visit was made to Germany, on behalf of Lloyd's Register, to inquire as to the progress of welding in that country. In view of the depressed state of shipbuilding at that time there was little actual welding being done, although it was clear it was anticipated that the practice of welding would be largely adopted when the industry revived. In the following two years other Continental countries were visited for the same purpose, and everywhere a keen desire was expressed to be acquainted with the latest practice and experience in welding and an ever increasing extension of its use in shipbuilding.

The first all-welded ship built in the United Kingdom subsequent to the *Fullagar* was the *Peter G. Campbell,* built in 1933 by Messrs. Swan, Hunter and Wigham Richardson Ltd., dimensions 179ft. by 34ft. by 15ft., an oil tank ship built for service on the Great Lakes and canals of America. One noteworthy feature is that this was the first vessel in which special attention was paid to the design from the standpoint of welding, and pre-fabrication in panels was adopted. She was followed in 1935 by the same builders' *Moira,* a 250ft. tanker, the first welded sea-going vessel of this type.

The study and attention devoted to welding during this period were reflected in the International Symposium on Electric Welding held in London in 1935. Practically all countries were represented at this gathering, at which about 150 papers were presented covering every aspect of the subject. A special sub-section was devoted to welding in shipbuilding, on which subject an interesting international discussion ensued. In particular, the German representatives, while agreeing that coated electrodes gave better results, contended that bare wire rods were quite satisfactory, an opinion vigorously combated by speakers from Great Britain and the United States, the latter in particular strongly advocating the use of coated electrodes.

The year 1936 saw the building of the *R. P. Resor,* the first large welded tanker constructed in the United States. This vessel was 435ft. in length and was all-welded in way of the oil compartments. From this date onward there came that steady stream of large welded tankers built in the United States and Sweden, which has been such a marked feature of shipbuilding practice in recent years.

As already mentioned, regulations governing the quality of electrodes to be used in shipbuilding had been prepared in the early days of its use, but the regulations of the Board of Trade and the different Classification Societies, while maintaining much the same standard, differed in various details. With a view to removing these differences and prescribing a uniform standard these bodies, at the instance of the Board of Trade, in 1936 collaborated to provide a common basis for the approval of electrodes.

An important new feature of these rules was the introduction of a requirement that specimens of each electrode, chosen from the manufacturers' stock, must be tested annually and be found to maintain the standard on which approval was granted. As the authorities interested carry out these tests independently, this procedure results, in effect, that in this country each maker's electrodes are inspected and tested three times each year. The value of this requirement in assuring the continued maintenance of the quality of the electrodes will be readily appreciated.

In 1937 the writer had the privilege in the United States of seeing at first hand the development of welding in that country. The most striking feature was the extent to which prefabrication had been developed, the size of the individual units considerably exceeding anything that had been attempted elsewhere, together with its correlative, the capacity to lift these large units on to the ship on the stocks.

Lifts carrying from 40 to 70 tons were common, and even in yards building small vessels provision is made for 25-ton lifts, which represent units of large size in relation to the size of the ship. At that time the use of electrodes of large gauge, 5-16in. and ⅜in., was being introduced and some difference of opinion existed as to the effect of the use of these electrodes in association with heavy currents to produce rapid welding. One electrode maker offered to carry out a series of tests to establish the composition of the welds so produced. This was done and an examination of the welds by steel experts confirmed the view that no exception need be taken to the use of these electrodes.

Some doubts were expressed as to whether the greatly increased local heating due to the large current would not produce an additional degree of distortion in the structure, but experience has shown that there is, if anything, rather less distortion with this system of a small number of runs with large electrodes than with the normal practice of a large number of runs with smaller rods.

At the Sun Shipbuilding and Dry Dock Co. an equipment was installed to permit the operation of the Unionmelt process of automatic welding. This plant, which has been described at length in various technical journals, in its essence includes the following essential parts:—

(1) A battery of hydraulic rams which completely fixes the position of the work.

(2) A welding machine which, by an electrically controlled motion, travels along the seam at a speed varying between 12ins. and 18ins. per minute. The electrodes (¼in. and 5-16in. in diameter) are of uncoated wire wound on a drum and a copious supply of flux powder is led to the work through a hose.

(3) A tilting table which allows this automatic welding to be applied to the connection of girders to plating.

After welding is completed on the upper part of the veed joint, the work is removed to another platform, there turned over and the operation of welding again performed by the same process by a portable machine. The current used for the main operation was 1,250 amperes and that in the portable machine 650 amperes. An equipment of this nature permits of great expedition of the welding process, and it is possible to weld completely 2½ to 3 of the transverse bulkheads of a large tanker in one day of 24 hours.

As this process involves very high temperatures, the arc temperature varying between 2,000 and 3,000 degs. Cent., in which important chemical and metallurgical changes are taking

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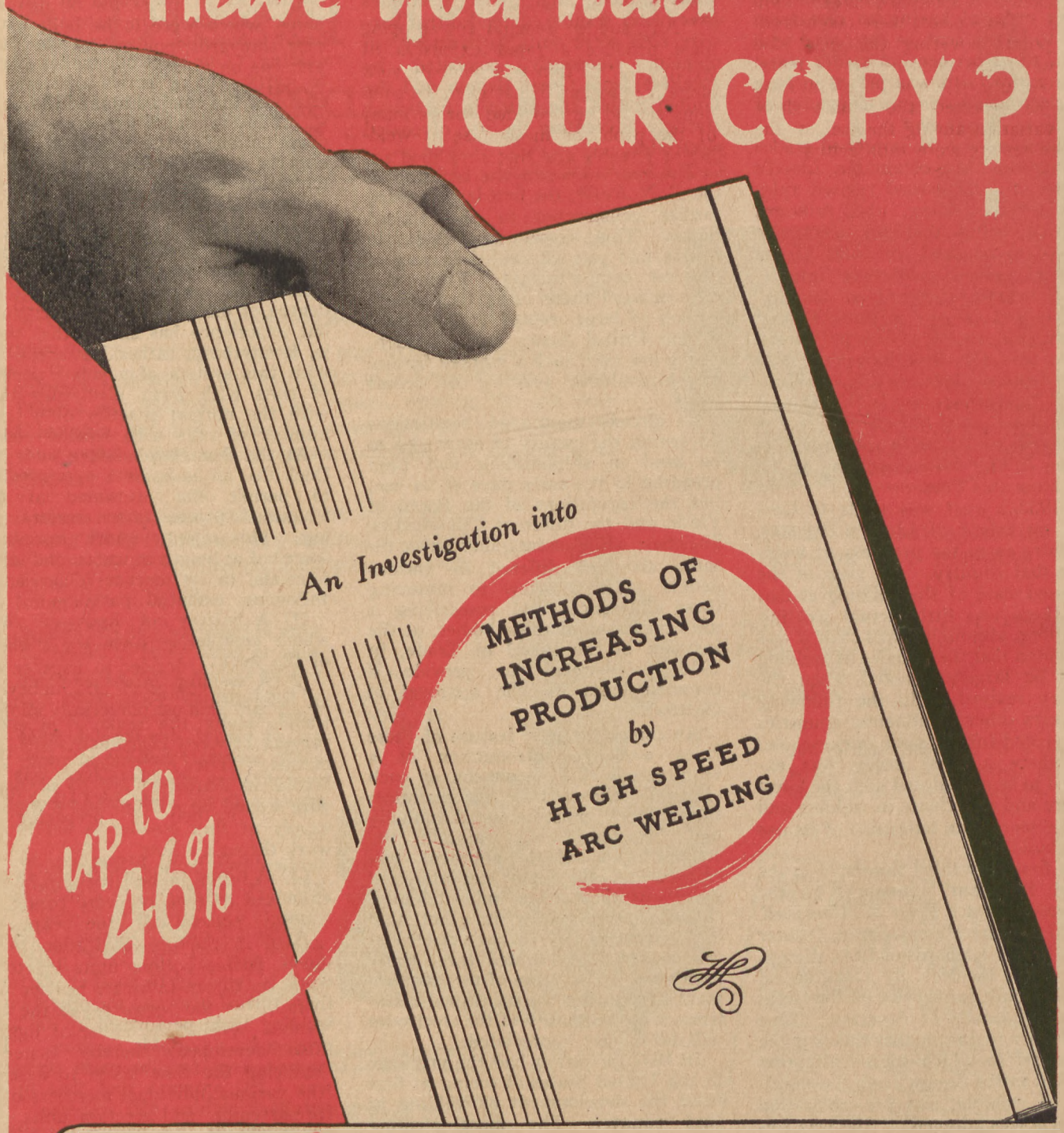

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place rapidly, it was suggested to the builders that some special tests should be made. They willingly agreed, and an investigation was made into the capacity of the material in the welded region to resist shock. Impact tests were taken on a selected sample of ship plating. Tests pieces were taken from eight points covering the weld, the point of fusion and the parent metal in the vicinity of the weld. While, as might be expected, the results show some variation among themselves, the average results were satisfactory.

A fact that struck the observer of electric welding in the United States at that time was its widespread application to vessels up to say 250ft. in length and to small craft such as barges, lighters and tugs; to-day electric welding has almost entirely supplanted riveting at this level of construction.

The training of welders received great attention and, while the method of training differed little from that in this country, the possession of a certificate of proficiency from a recognised authority is required from all welders. Despite the possession of such a certificate, the employer does not rely upon it, but takes steps to ascertain for himself the fitness of the welder for the task contemplated.

While these developments were taking place abroad, industries in this country which might benefit by the application of this process were thoroughly awake to its possibilities and steps were being taken to provide the best technical information on the subject. Following on the International Symposium of Welding in 1935 a programme of proposed research was drawn up and approved by the 17 societies who were associated in organising the symposium and the task of co-ordinating research into welding was entrusted to the Institute of Welding.

The Institute appointed a research council representative, as far as possible, of all the institutions which are concerned with the application of welding to industry. The programme outlined, which was certainly ambitious and covered a great variety of problems relating to the welding of both ferrous and non-ferrous metals, was entrusted to a number of sub-committees and a large number of panels dealing with particular questions. Many of the subjects are common to all forms of welding, such as the control of distortion, internal stresses, micro-structural alterations on the metal, but from the standpoint of this article the most important panel is that on ship structures under the chairmanship of Mr. C. S. Lillicrap, M.B.E., Deputy Director of Naval Construction, Admiralty. The following extract from the report of this council in 1938 on the proposed investigations as applied to shipbuilding might almost be regarded as prophetic:—

"Any sudden demand for shipping must produce a rapid extension of welding. . . . From this point of view alone it is essential that effective solutions should be provided for as many of the problems in the use of welding as possible and that simplified and standardised technique and methods should be established."

The members of this panel are representative of the Admiralty, Board of Trade, Classification Societies and various shipbuilding firms. The programme of this committee consists of an investigation of the behaviour of welded stiffeners in comparison with riveted stiffeners and a comparison of the effect of the rigidity of welded end attachments as compared with riveted end attachments at the end of stiffeners. The funds for this research have been provided by the technical societies, shipbuilders, electrode manufacturers, with a contribution from the Department of Scientific and Industrial Research.

A beginning was made with the testing of specimens consisting of 12in. channels or stiffeners of equivalent strength with 24in. of plating attached, having a length of 16ft. Comparative tests were made on riveted and welded specimens with a variety of end attachments, also both riveted and welded. The results of this series of tests were published in a paper to the Institution of Naval Architects by Mr. J. L. Adam in 1940.

It is proposed to continue these tests with specimens of different length and of different scantlings, and the results when finally analysed should have an important bearing on the future application of welding in shipbuilding. A sum of about £1,500 has already been spent on these experiments, apart from much generous help, and the scope of the investigation promises results fruitful in their application to shipbuilding practice.

It might be said that the position at the outbreak of the war was that in the United States and in Sweden, and in a lesser degree Germany, the construction of large all-welded ships, particularly tankers, up to about 500ft. in length, was becoming standard practice while in Great Britain builders were, with few exceptions, employing welding only for parts of the structure of a subsidiary nature.

The advent of the war and the developments in the United States have, however, given a fillip to welding which is completely altering the position. In the early days of the war the British Government sent to America a purchasing commission which placed orders for 60 merchant ships, which were to be built in two new shipyards, one on the East Coast and one on the West Coast. In that country, at that time, shipbuilding had not developed to the phenomenal extent to which it has done in the past two years, and the chief problem to be faced was the dearth of skilled shipyard craftsmen, particularly platers and riveters. It was decided, therefore, to replace riveting almost entirely by welding and by standardisation and pre-fabrication to reduce the building of the ships to a normal constructional basis.

The establishment of new shipyards on vacant sites also made it possible to lay them out so as to employ pre-fabrication to the fullest extent. The question of training unskilled labour was of paramount importance and efficient electric welders were produced in a time in which it would have been impossible to train riveters and caulkers. The Unionmelt process was used wherever practicable and advisable and experiments were carried out to ascertain the most economical type of joint with this process. As a result of these experiments it was, at an early stage, decided to dispense with vee edge preparation and unbevelled edges were almost universally adopted. The accuracy of plating work was given special attention but the inexperience of the operatives was discounted by the adoption of the flame-cutting method of preparing the material.

As the contract proceeded, developments of the methods of pre-fabrication and of erection were continually taking place, and the experience gained in the pre-fabrication of the large double bottom units led to the decision to pre-fabricate heavier units comprising the forward and the after peaks. An extensive use of jigs was also developed, thereby materially reducing the time taken to assemble the various individual members of the pre-assembly and erection units.

The attention given to detail in the early stages led to a confidence which ultimately made possible the gradual speed-up of the operations involved. The time spent in construction on the ways was reduced in the last vessels built to one-quarter of that taken to build the first without any sacrifice of efficiency or finish of workmanship. The results of the efforts of all concerned to produce ships in the shortest

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MUREX have justifiable reason to be proud of their service organisation; of its unequalled efficiency, its scope, and the readiness with which it is rendered. In every district MUREX welding engineers are prepared to assist and advise on any welding problem. There is a special staff to assist in the design of welded structures, etc.

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At Waltham Cross the MUREX WELDING SCHOOL provides special instruction courses. One is designed for the training of welding operators, and another provides for technical foremen, supervisors and designers. Each course lasts only two weeks, but instruction is designed on such intensive and practical lines that students, in that short time, obtain a remarkable knowledge of the subject. Full details supplied on request.

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possible time are by this time well known and the pioneer work carried out in the two British yards in the United States had no small influence on the subsequent development of the enormous programme of the Maritime Commission after the United States entered the war.

The record breaking output and the almost incredible speed with which the large welded pre-fabricated units are assembled on the slipway are matters of common knowledge, but in comparing the achievement of the United States shipbuilders with the more modest performance of their friendly rivals in this country, due regard must be paid to the differences in the conditions under which the respective programmes are carried out.

The new American shipyards were laid out on clear sites with ample room for pre-fabricated work as compared with the cramped accommodation of most British shipyards; it was possible to instal lifting plant of considerable capacity instead of the usual five or at most 10-ton derricks with which we are familiar, and the man-power of one of these yards was equal to the total man-power of the whole British shipbuilding industry. Notwithstanding these advantages, the organisation and output of the American shipyards represent American capacity for drive and hustle at its best, and their performance reaches a standard undreamed of hitherto.

Meanwhile the adoption of welding makes steady and rapid progress in this country. Few ships are built in which welding is not to some extent embodied, and the ratio of welding to riveting grows greater daily. This is particularly true in the case of tankers, of which several of the all-welded type are in course of construction and more are contemplated.

The staff of the Director of Merchant Shipbuilding has been strengthened by the appointment of members with special experience in the construction of welded ships and the Classification Societies have followed a similar course in order that builders may have the benefit of expert advice in installing and operating welding plant. In addition, special courses of instruction are being held in different centres for supervisors in the examination of welding and for draughtsmen in problems of design to enable the maximum advantage to be reaped in design.

On the latter point it is clear that as the present methods of attachment are replaced by welding it will be desirable that the form of rolled sections now in use should be modified and the steel makers are fully alive to this question and will not be found wanting when the most suitable forms of section are determined.

The future lies with the all-welded ship. Experience up to the present time has been satisfactory and we have good reason to believe that the practice has now been established on a sound theoretical and practical basis. At the same time it would be unwise to predict for such vessels a future wholly exempt from the damage to which we have been accustomed in their riveted predecessors.

As the application of electric arc welding to shipbuilding is increased and the number of all-welded or partially welded ships grows, we may expect to have problems still to solve concerned with residual stress, with temperatures and with personnel; already we have had a few reminders that these problems exist, but there is little doubt that as they arise they will be satisfactorily solved.

FULLY AUTOMATIC WELDING PROCESS

By the BRITISH OXYGEN CO. LTD.

SHIPBUILDING to-day is undergoing a change in method as great and as far-reaching as the change made years ago from wooden to iron construction. Modifications of method occur periodically in most industries, at times due to the stimulus of changing needs, at others to the imperious demands and urgent requirements of war.

The present change of method originates in the necessity for speed of construction, since the method of joining the essential parts of ships' structures now in common use is held to be slow, and to possess inherent technical disadvantages which are emphasised by the hazards to which ships are subjected in war service.

Electric arc welding has emerged as the means by which increased production and higher efficiency may be obtained for construction and repair, and to-day, shipyards all over the world are making ever-increasing use of electric arc welding apparatus, both manual and automatic.

The extent to which either form of electric arc welding may be used in shipbuilding depends on a number of factors, among which are the type and design of ship to be built, the space available in any given yard, and the capacity and form of the lifting equipment. The latter is very important, because it usually determines the amount of pre-fabrication which can be done outside the actual slipway, thus shortening the time between keel-laying and launching. Generally, however, it may be said that of the total footage of welding to be carried out on a given ship, any proportion from 15 to 30 per cent. may be accomplished by the automatic arc process, depending on the manner in which the variables already mentioned link together.

Foremost among automatic electric arc welding processes is the Unionmelt process, which possesses features such as speed, ease of handling, high quality of deposited metal, and which, by virtue of certain characteristics to be described, keeps distortion and shrinkage to a minimum.

The essential feature of this welding process is that a granular slag-forming powder is applied automatically along the seam ahead of the welding rod, which is a copper-coated continuous bare wire. The weld takes place beneath this layer of powder, some of which is caused by the heat of welding to melt and form a liquid flux blanket which effectively shields the molten weld metal from contamination by atmospheric elements. In operation, heat is generated by the passage of an electric current from the rod to the plates being joined.

The granulated slag - forming material is known by its trade name "Unionmelt," and from this the process derives its name. Beneath the layer of Unionmelt intense heat is developed, which causes the rod and the edges of the steel plate being welded to be melted and fused together. Molten metal from the rod is intimately mixed with the molten base metal to form the weld proper. The heavy "melt" blanket makes possible the employment of very much higher current densities than are used in normal hand arc welding.

The fused Unionmelt powder is a good heat insulator, and tends to conserve the heat of welding into a relatively small zone. As a result of this, the degree of distortion, with Unionmelt welding, due to expansion and contraction, is very much less than that arising when other methods are employed. Further, the weld metal cools at a relatively slow rate beneath the layer of powder, with beneficial results.

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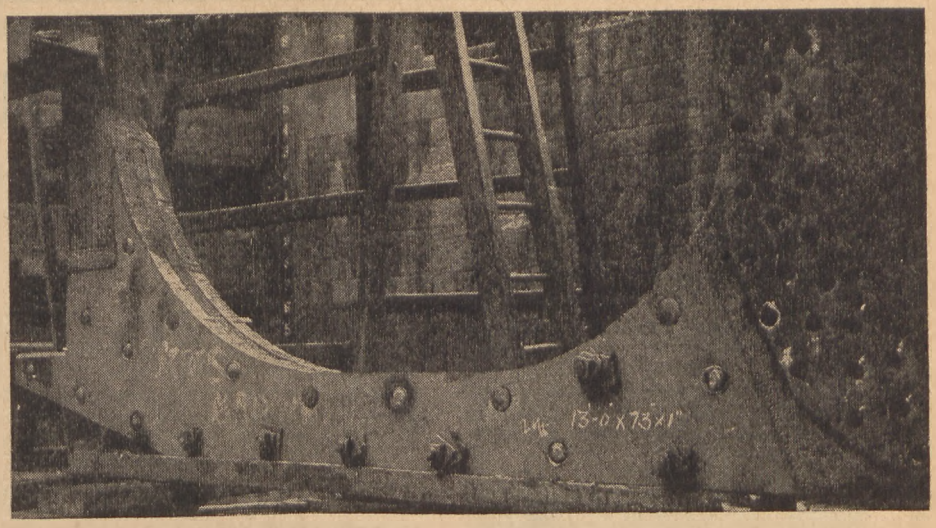
The Unionmelt welding process is fully automatic and in the shipbuilding industry, comparatively small, portable machines may be employed to carry out the functions of distributing the Unionmelt powder over the seam to be welded, carrying and feeding the welding rod, applying power to the weld, and moving the whole along the seam at the correct speed to enable the weld to be carried out. This machine is known as the " U " type.

The welding rod is automatically fed into the weld zone by means of knurled rollers which are driven by an electric motor through a reduction gear box. The rate of rod feed is closely controlled in accordance with the demands of the welding zone, by means of automatic electrically operated equipment, which sensitively regulates the rod feed motor. The settings of this control equipment may be varied at will to enable welds to be carried out on different thicknesses of plate. The whole machine is mounted on a variable speed electrically-driven carriage, which is arranged to run on a sectional track laid down parallel to the seam to be welded.

Although the weld takes place beneath the layer of Unionmelt powder, the operator of the machine is able to tell at a glance by the action of a voltmeter and ammeter whether the welding operation is progressing correctly. No light, radiation, smoke fumes, are apparent, and the operator, therefore, needs no shield or goggles, and the machine, when once set out for a particular seam, will weld automatically without attention, no matter how long it may be.

One of the results of the high current employed is that welds made by the Unionmelt process have a much greater degree of penetration than is obtained by other welding processes. For example, it is possible to weld 1in. thick steel in one pass at a speed of 10-12ins. per minute (i.e., 50-60ft. per hour), using a current of about 1,500 amperes at a voltage of between 38 and 40, complete penetration being obtained.



Section of triple armour plate in place, welded to the rudder post and ready to be finally secured by riveting to the shell plating. (See description on Page 253).

The auxiliary electrical equipment usually consists of one or more transformers fitted with variable reactors to enable the output of the secondary to be regulated to the amperage desired. The input to these transformers is single phase A.C.50 cycles at 400-440 volts, and the demand will not exceed 100 K.V.A. on the feeders. A remote controlled welding contactor is employed for switching the power to the primaries of the transformers. The master control panel for the welding head and its auxiliary circuits are arranged on a common base with the welding transformers, so that the whole power pack may be lifted by means of a crane. The control apparatus for the welding head consists of a thermionic valve device which causes the supply of power to the welding head motor to be regulated in accordance with the voltage drop across the welding zone. This enables the rod feed to be sensitively controlled, thus giving a weld which is very smooth and even in finish.

Unionmelt equipment of the type described above is used for pre-fabricating bulkheads, welding bottom shell, tank top and deck plating, and similar work. The equipment may be employed for fillet welds in addition to butt welds. In the former case special adaptors are required to enable horizontal fillet welds to be produced. A typical example of welds of this kind is usually employed in the joining of stiffeners to bulkheads and deck panels. Plug welding which is a form of intermittent welding may also be carried out by the Unionmelt machines.

From the foregoing it will be seen that Unionmelt welding must be carried out in the downhand position, i.e., the process cannot be applied to vertical or overhead welding. The physical and metallurgical properties of Unionmelt welds are good. A large number of tests have shown the weld metal to be clean and dense and to possess high strength, good ductility, and elongation, and exceptionally good fatigue resistance.

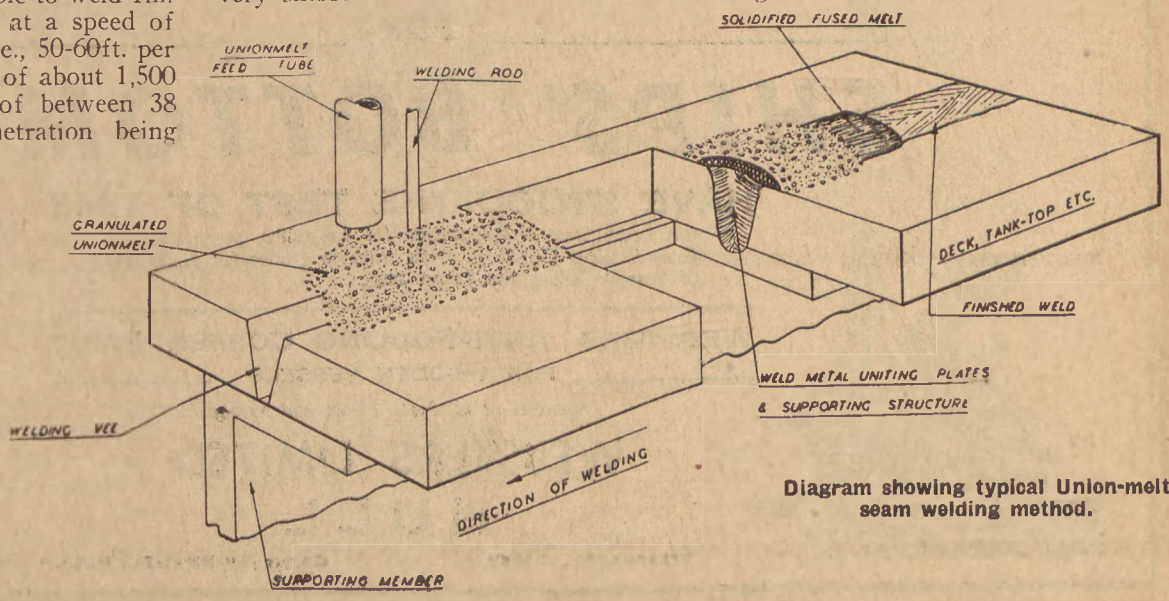


Diagram showing typical Union-melt seam welding method.

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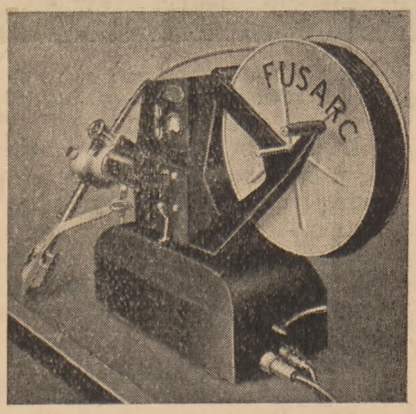
THERE is now available to British Shipbuilders a British - made Automatic Arc Welding Plant specially designed for site welding. This is the Fusarc "MARINE" type Automatic Deck Welder, an ideal machine tool for carrying out the extensive range of downhand butt welding which is presented by welded ship construction to-day. The machine travels at controlled speeds on a power operated bogie. It is exceptionally mobile and manoeuvrable, and the great feature of the plant is the speed with which it can be applied to the work.

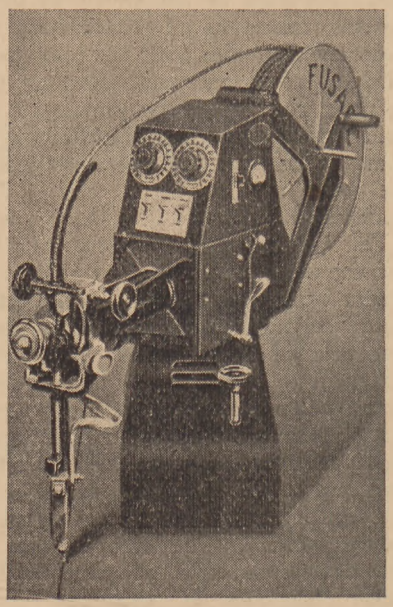


Rear view of the Fusarc "Marine" type Automatic Deck Welder, showing the welding nozzle arranged at 45 degrees for carrying outlap or fillet welds.

Amongst its many outstanding advantages are the following :—

1. Simple in Operation. An entirely unskilled worker can produce satisfactory welds after a few hours instruction.
2. Can be Operated from any existing source of Electricity Supply, A.C. or D.C.
3. High Power Factor. Perfect balance on all Supply Currents.
4. As it is trackless, time losses in laying out and lining up a track or runway are eliminated, and curved welds are within its scope.
5. Requires only two trailing cables, which have means of rapid coupling and de-coupling.
6. The welding nozzle can be inclined to an angle of 45 degrees on each side for the purpose of carrying out lap welds.
7. Speedily removed from one site to another.
8. Employs continuous fully fluxed electrode.

The high output obtainable with the "MARINE" Automatic Deck Welder and its great assistance in regard to the labour problem, cannot fail to interest all who are concerned with ship construction to-day. Interested executives are invited to apply for further particulars from Department "M" 18, Fusarc Welding Company, Letchworth, Herts.



Head on view of the Fusarc Marine type Automatic Deck Welder, showing position normally arranged for carrying out butt welds. All the controls are readily at hand, the small steering wheel at the front of the carriage being used to keep the machine on a true course. The small lever at the base of the welding head is used for locking the head at any desired point on the carriage. The head swings through an arc of 180 degrees to bring the welding nozzle fore or aft of the carriage as required.

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MODERN MOBILE WELDING PLANTS

WHEN the first British shiprepair workers were trained for welding with metallic arc well over 32 years ago, by the company with which I am associated, their services were directed primarily to the repairs of marine boilers, but the utility of arc welding in shiprepair work became so apparent, that it has now become an indispensable branch of the industry.

Its uses are so well known to those interested in the upkeep of ships that it is not necessary to reiterate the description given by various writers of the many and much varied types of repair jobs in which it has proved its worth—jobs varying in magnitude from fractured stern frames to the reinforcement of worn parts of steam winches.

In boiler repairs, the welding of furnace cracks, building up of corroded surfaces, manhole door spigots and facings and tube holes has become everyday practice, but, on occasions, much more comprehensive jobs are carried out, such as welding in entirely new sections of tube plates and combustion chamber backs, new sections of plate into end shells, and the cutting out and building up of cracks in the radius of end shell plates, some of which have extended for 10 or 12 feet in length.

Repair work under wartime conditions has undoubtedly enhanced the value of welding, in that considerable delay is at times avoided by welding worn or broken parts which in normal times would have been renewed, and further, damaged castings are often replaced by steel fabrications, which considerably reduce the possibility of further damage, as well as effecting a saving in time and cost.

What the future may hold in store for welding in shiprepairs can only be surmised, but it appears obvious that, with the very considerable increase in the amount of welding now used in ship construction, a heavy call will be made on the facilities of electric welding concerns which specialise in ship-

By JAMES BLIGHT
British Arc Welding Co. Ltd.

repairing, and with this end in view, modern plants are already being brought into operation, some electrically and others oil engine driven, capable of supplying up to four arcs per machine.

These plants have of necessity to be mobile in order that they may readily be transported, as occasion arises, to ships at cargo handling berths or drydocks, or at river or harbour moorings.

DEVICE TO SPEED ELECTRIC WELDING

THE demand for speedier welding in the shipyards has resulted in the development of new types of equipment and electrodes for electric welding. An interesting development in this connection is the Murex deck welder, shown in the drawing herewith.

Its application is the butt welding of seams in steel plate in the downhand position, using a 5/16in. diameter electrode, which has been specially developed by Murex Welding Processes Ltd. for use with this equipment. High welding speeds are obtained, and unskilled labour can be

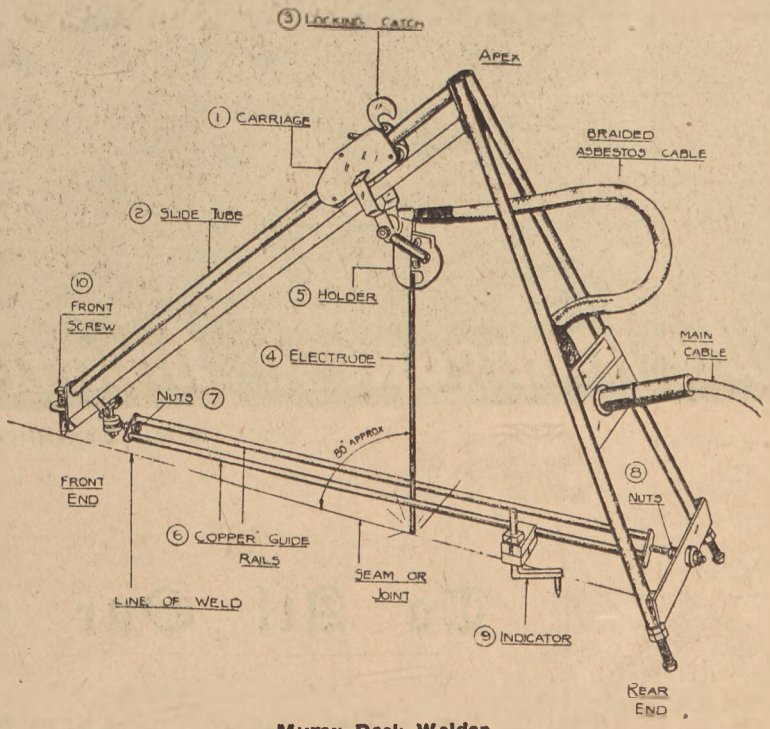
By
MUREX WELDING PROCESSES, LTD.

utilised. One 5/16in. diameter electrode 18ins. long deposits approximately 17½ins. of weld in 80 seconds. Plates from ⅜in. to ⅝in. thick can be welded in two runs. Welds can be made continuously forward, alternatively in the "back step" method.

This equipment comprises a triangular frame structure, approximately 30ins. from base to apex. The structure is supported at three points, which are locating points determining the line along which the weld is to be made. A small carriage carrying an electrode holder is allowed to fall freely down one member of the structure from a point adjacent to the apex. The electrode is in continuous contact with the plate being welded, but is designed so that the coating of the electrode melts at a speed which enables a flow of metal to pass from the core to the joint being welded.

No attention is required during the actual welding operation, consequently it is possible for one operator to employ two equipments on adjacent seams. Provided these seams are parallel and relatively close together the operator can proceed with one equipment, allowing it to run, after which the second equipment can be put into operation. There is ample time to move the first equipment to a new section of the seam, fit a new electrode, and start the welding whilst the second is in operation.

Alternating current at 50 cycles has been found most suitable for this class of work; 100 volts open circuit is desirable, although satisfactory results have been obtained with 90 volts open circuit. Direct current is not recommended as the magnetic arc blow affects the stability of the arc, and consequently reduces the amount of penetration obtained.



Murex Deck Welder

With Best Wishes for 1943

DOCK ROAD, BIRKENHEAD.

To All Our Friends at Home and Abroad.

MOBILE MACHINE FOR SHIP CONSTRUCTION

THE rapidly increasing application of the arc welding process to ship construction and repair has undoubtedly presented an acute labour problem. The limited number of skilled welders in the country are already fully employed on important work in all branches of industry, and whilst it is certainly possible to train, in a matter of weeks, a large proportion of operatives to meet much of the potential demand in the shipyards, this does not solve the problem of the need for highly-skilled experienced welders.

In the circumstances, every man skilled in the arc welding process must be employed where his skill can be used to the greatest advantage. Such men should not be employed in these days on the simpler class of downhand welding of a repetition character while less skilled welders or machines are available for the job.

Every effort must be made to allocate that part of welded construction requiring the greatest skill to the highly-trained and experienced operatives, and in this connection the machine tool can play a vital part in releasing such men for work where their skill is indispensable.

A large proportion of the welding entailed in the construction of a welded ship consists of long straight runs in the form of butt, lap and fillet joints where the time required to deposit large quantities of metal can entail thousands of man-hours when carried out by hand welding. It is undesirable that highly-trained welding operatives should be tied down to "repetition" work of this character. The recent introduction of a new mobile machine tool which not only deposits weld metal with greater consistency and accuracy than a manual welder could achieve, but also has an output equal to some eight to 10 manual operatives, is therefore a step forward in progress which cannot fail to be of the utmost interest to shipbuilders and shipbuilding authorities.

This machine tool is the marine automatic deck welder and is the outcome of developments on the already well-established range of automatic arc welding plant produced by the Fusarc Welding Co., Ltd., of Letchworth.

Fusarc mechanised welding is employed extensively in industry to-day for the production of a wide range of mass-produced arc-welded fabrications. In general engineering of this nature, the Fusarc welding heads employed are the "tractor" type on a tubular runway, and the "stationary" type employed in a fixed position. To-day there is available a third type, the Fusarc marine model automatic deck welder.

This plant incorporates the same principle of arc control and electrode feed that has proved successful in the "tractor" and "stationary" machines, and the actual welding head and internal mechanism are more or less constructed on the same lines. In order to obtain the utmost mobility and manoeuvrability, however, the general external arrangement of the plant has been entirely redesigned.

The front of the welding head on which the nozzle is mounted has been extended so that the nozzle can be carried to the extremities of a run or close up to a vertical member. The entire welding head is mounted on a power-operated carriage, and is pivoted so that it can be swung round fore or aft, or alternatively locked at any position in the 180 degs. swing. The carriage is provided with a motor, reduction gear unit and gear box, the latter giving low, neutral and top gear changes, operated by a small lever at the rear of the carriage.

The motor is of a variable speed type having a panel-mounted dial control. Thus an infinitely variable range of speeds from 25 to 130 feet per hour is obtainable. The front pair of wheels are mounted upon a special steering mechanism operated by a small hand wheel at the front of the carriage, and by this means the operator is enabled to keep the machine on a true course without difficulty.

This automatic deck welder is a d.c. plant operating from a special d.c. multiple generator group, which supplies the welding current and also an auxiliary current of 60 volts d.c. for the welding head and carriage motors. There are only two trailing cables on this deck welder, and these are provided with special couplings for rapid connection and dis-connection, which is a feature of some importance on a plant which must necessarily be moved from site to site.

The controls have been reduced to a minimum so that an unskilled worker can be trained to operate the plant in the matter of a few hours. Once the desired settings for arc length, electrode feed and rate of travel have been set, repetition is merely a matter of switching. Three switches of the "on" "off" type govern electrode feed, carriage motor and welding current.

An important feature in a machine tool of this nature is that it should be easily and rapidly applied to the work. Any undue time losses which might be caused by taking the machine to the job, lining up or other preparations for welding would defeat the primary object of employing the plant.

In this connection it is of interest to note that the Fusarc deck welder can be wheeled into position after the fashion of a lawn mower, by means of special handles provided on the rear structure of the machine. As soon as the machine is alongside the joint to be welded, the head is swung round on the carriage to bring the welding nozzle over the joint, and is immediately locked in this position by the movement of a lever.

There is no track or runway to lay out and line up, and the welding operation can be commenced immediately, the operator finding no difficulty in keeping the nozzle over the joint. He can see the arc through a welder's screen, and so maintain a true course with the sensitive steering hand wheel provided. In effect, therefore, all the necessary lining up is carried out while actually welding.

By

FUSARC WELDING CO., LTD.

For lap welds, and any fillet welds which it might be possible to make out in the horizontal/vertical position, the welding head is fixed in line with the carriage, and the nozzle is inclined to an angle of 45 degrees by means of an angle control sector and hand wheel. Incidentally, this is a useful secondary control for positioning the nozzle over the work.

A small fabricated stool on castors is provided for the convenience of the operator. This enables him to move along with the machine as it travels along.

As previously mentioned, the primary function of this machine is to carry out the considerable amount of downhand butt welding presented in ship construction. The extensive footage of welds on decks and tanks is an ideal application for a machine tool of this nature, and the Fusarc process employing fully fluxed continuous electrode provides not only high speed of output but also high quality welding.

It is common practice in modern welded ship construction for the joints of deck plating to be supported by deck beams, and for this type of joint the Fusarc process gives satisfactory results. The plate edges need no

The British Arc Welding Co. Ltd.

ESTABLISHED — APRIL, 1910

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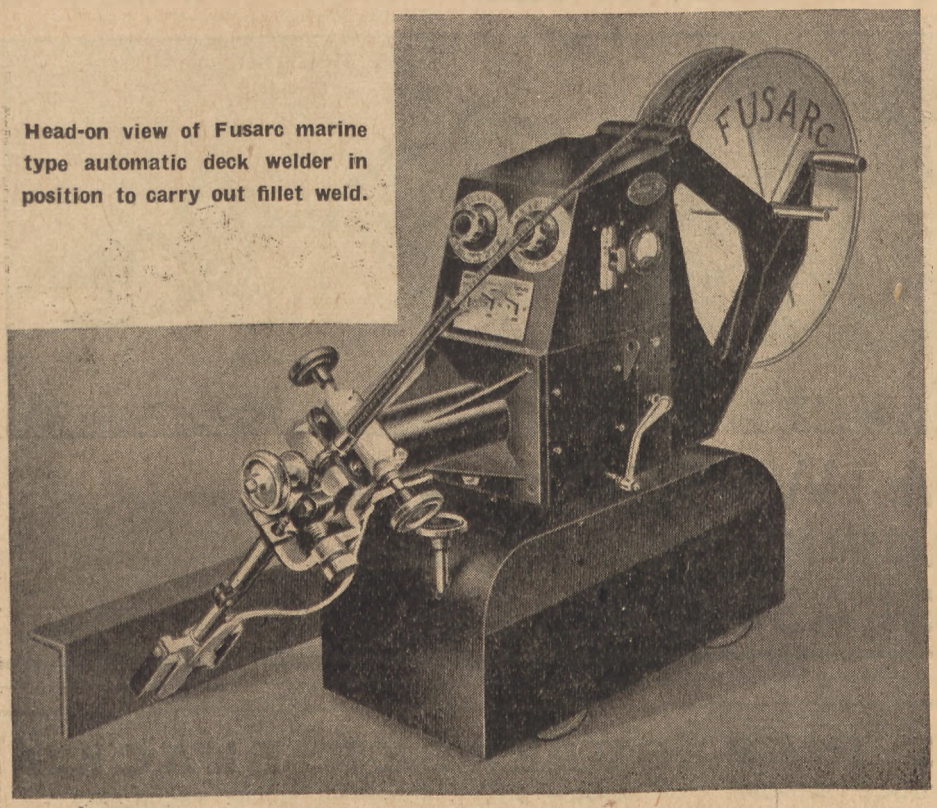
preparation provided they are reasonably straight, so that ordinary mill sheared or oxy-cut square edges can be satisfactorily employed. A small gap between the plates is required, and the important consideration is that this gap should be reasonably consistent throughout the length of the plates. The width of the gap naturally depends on the metal thickness involved, and usually varies from ⅛in. to ¼in.

The Fusarc deck welder employing Fusarc "industrial" type continuous fully fluxed electrode will carry out welds of this character at high speed, giving penetration well into the supporting beam, and providing a neat semi-flush weld on the surface. Welding speeds vary considerably according to the degree of perfection in fitting up the plates, but the process is very considerably faster than the manual method apart from its advantages of consistency. Having regard to the rapidity with which this machine can be "got to work," the efficiency factor of the plant is high.

Another useful application is provided in the plug welding method employed to supersede the riveting of a deck plate to a beam on the underside. In this case the width of plate spans three beams, and the method is employed to secure the plate to the centre beam. In plug welding, the plate only is punched, so that by welding in the punched holes the beam on the underside is well secured.

As an instance of the speed and efficiency with which the Fusarc deck welder carries out this work the following figures are interesting. On ½in. plate having ⅞in. diameter holes the welder fills the hole with weld metal leaving a neat semi-flush surface and having good penetration into the supporting beam over the full diameter of the hole. Each plug is completed within about 22 seconds, and on an average some 80 plug welds per hour can be carried out in this way.



Head-on view of Fusarc marine type automatic deck welder in position to carry out fillet weld.

Apart from site welding on decks and tanks, this machine tool can be employed for the prefabrication of various sections, particularly bulkheads where further extensive runs of butt welding are required, and a special feature in this connection is that as the machine is independent of any form of track it can be used on curved joints. Thus it is possible to follow the contour of a section, or for that matter the contour of the decking on site.

This mobile deck welder employs a special type of fully fluxed continuous electrode having exceptionally good mechanical characteristics. It is of patented construction permitting welding current contact to be made with the core wire without impairing its fully coated properties. The type recommended for ship construction is known as "industrial," the mechanical characteristics of which are as follow :—

Ultimate strength ...	27/30 tons per sq. in.
Yield Point	22/24 tons per sq. in.
Elongation, 2-in.	33 per cent.
Reduction of area ...	55 per cent.
Izod impact value ...	80 ft. lbs.
Brinell Hardness No. ...	130

This electrode is available by the ton in the form of coils weighing from 40/50 lbs. It is armoured against damage in handling or use, by a steel tape outer covering, and is supplied in watertight drums of 4 cwt. capacity for convenience of handling and storage.

To sum up, this is a British produced machine tool for arc welding, mobile, easily operated by unskilled labour giving high output and efficient results. It is expected to fill a place of growing importance in the shipbuilding industry.

USE OF STAINLESS STEEL ELECTRODES

By E. G. BOURNE-VANNECK
(Philips Industrial)

PROMINENCE has been given in America, and has been echoed in this country, to the effect of salt water corrosion on the safety factor and fatigue limit of propeller shafts. It is clear that reduction of the safety factor in design is the point aimed at, and in this connection it is interesting to give a short account of procedures used to increase the resistance to corrosion of propeller shafts which have already been in service.

This procedure has been developed as a means of repair or maintenance, but its use must now be considered as an application to be carried out before installation. This fact has been recognised so clearly by certain Continental shipyards that it has been their practice to build up these shafts, or parts of them, with surface layers of special corrosion resistant material.

By means of arc welding, a single or sometimes double layer of austenitic material is deposited on the shaft. Electrodes commonly used for this purpose are of the 18 per cent. chromium, 8 per cent. nickel, 3½ per cent. molybdenum type, and results have so justified this application that it has become standard procedure in these yards. The well-known corrosion resistant properties of this

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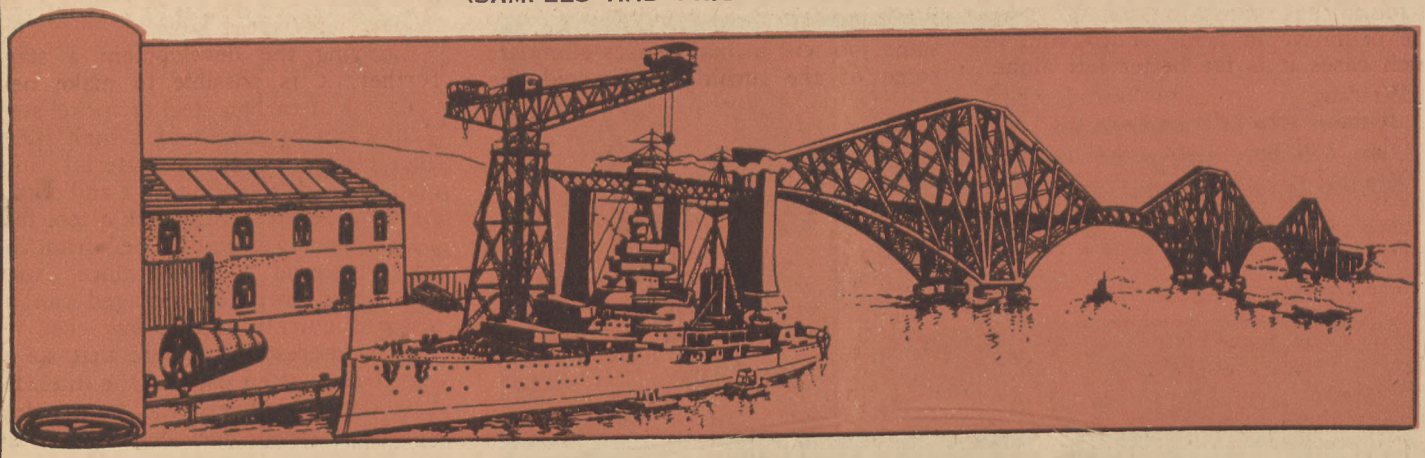

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material are especially suited to sea water conditions.

Welding procedure requires a certain amount of elementary precaution. If controlled heating can be provided, a temperature of 300 degs. Cent. should be reached and more or less maintained during welding. It is open to question whether preheating is an advantage or not. Too often it is found that preheating arrangements are primitive in many shops, and in such cases it is far better left alone.

Welding on to a preheated shaft presents certain discomforts to the welder, and no serious disadvantages have occurred when welding these shafts in the cold state. Freak conditions such as frosty mornings in open shops are, of course, excepted.

The first run of weld metal should be applied circumferentially to the shaft, so as to provide a shelf and eliminate craters at the end of a longitudinal run. The first layer of weld metal is then deposited longitudinally, and the shaft turned 180 degs. and a second run put down. Subsequent layers are applied by turning the shaft 90 degs. in order to distribute the placing of the weld metal. The shaft should be placed on suitable supports or "V" blocks, and care should be exercised to avoid uneven movement or the putting of any extra strains on the shaft, as it is well known that distortion or buckling is an ever-present risk with this class of work.

The size of electrode that should be used is 8 s.w.g. (occasionally 6 s.w.g.) connected to the positive pole, direct current. Peening offers some advantage, provided it is done while the weld metal is turning from bright red to dull red. If it is possible to deposit a second layer of weld metal, machinability is much improved, and pitting and other irregularities in the surface are eliminated. The second run should be deposited in the opposite direction to the first. To allow for two runs, of course, the shaft should be prepared about 3/32nds. of an inch under size. The two layer deposit gives less dilution with the parent metal and consequent ease of machining. In carrying out this application it is important to continue welding and to avoid prolonged interruptions. The provision of several welders on the same job will in many cases eliminate some of the turning and avoid the complete interruption of the work in progress.

Efforts to convince marine engineers in this country have not been an unqualified success, but there are signs now that interest has been aroused, and it is confidently expected that if similar results are obtained from trials here as they have been obtained in other countries, then a case will have been made out for the adoption of this method as standard practice.

Surfacing by arc welding is a very useful, but little known application, of rapidly developing engineering practice. Electrodes are on the market capable of providing a deposit which will stand up to the different types of wear encountered, whether abrasion such as caused by sand or gravel, sliding or rolling abrasion, impact or corrosion.

Machine parts or equipment, which wear rapidly in service, can be salved and a new life, longer in most cases than its original, can be provided at lower cost by surfacing the part with the particular material selected for the service the part will have to stand. This application, furthermore, permits of the fabrication of such equipment from standard steel parts and reinforcement by these special deposits at the point where the demand is heavy.

Apart from hard wear, abrasion and impact, this method has now been extended to the repair and fabrication of certain cutting tools. This movement has been given great impetus by the necessity for conserving high speed steel, of the 18 per cent. tungsten type. Tools which otherwise would be scrapped and which cannot be replaced to-day can be repaired, and a cutting edge put on that will give results equal to new high speed steel.

Carrying the development a stage further, it is possible to make new tools out of carbon steel or nickel steel blanks and by means of a high speed steel electrode deposit material sufficient only for a cutting edge and obtain the same service from such a tool that has previously been obtained from the solid material. Furthermore, such tools when worn or damaged can be restored quickly and at low cost.

It is interesting to note that stainless steel is often used as the intermediate deposit between the parent steel and high speed steel deposit, as the strength and ductility of this chromium nickel material enables a satisfactory bond to be obtained. It is also advisable to ensure that the material deposited is of actual 18/4/1 steel. Alloys or substitutes, although in many cases giving excellent results, often require slightly different procedures in machining, which causes complication in the tool room.

If the deposit of the same material as previously used is obtained, standard procedures can be adopted, and the welded tool put into service to replace the original without any alteration in speed of feed, &c.

It is worth noting that, although claim is made only to deposit material equivalent in service to the original tool, it is usually found that the welded tool gives slightly better results on the first cut, and even better results still after the first grinding.

SPECIALISED WELDING AND SHIP REPAIRS

FEW things have been more satisfying about ship repairs than the speed and dependability with which they have been carried out. The most versatile aid toward rapid re-conditioning is welding, the varied applications of which have extended in some directions with almost revolutionary results, so much so in fact that only those in constant touch with this class of work can appreciate fully its wonderful flexibility in meeting widely divergent needs.

In normal times wear and corrosion are the common enemy; nowadays damage, usually resulting from concussion, has introduced many special needs. This is an important point, for modern electrical and gas welding equipment has done nothing to reduce dependency upon the operator for a superlative result, so far as repairs are concerned. It is for this reason that a good deal of work is now being carried out by welding specialists.

Often the time factor is all-important, and whilst work upon the hull usually allows a number of operators to be occupied at one time, where the machinery is concerned the repairs may have to be done in cramped quarters. In the case of naval ships measures can be taken to mitigate shock fracture, whereas merchant vessels are relatively vulnerable, as no provisions of this kind are at all usual.

By C. W. BRETT, M.Inst.W.
Managing Director of Barimar Ltd.

Some degree of protection can be secured by welding additional supports to large components such as the exhaust manifolds and expansion chambers of oil engines and so on.

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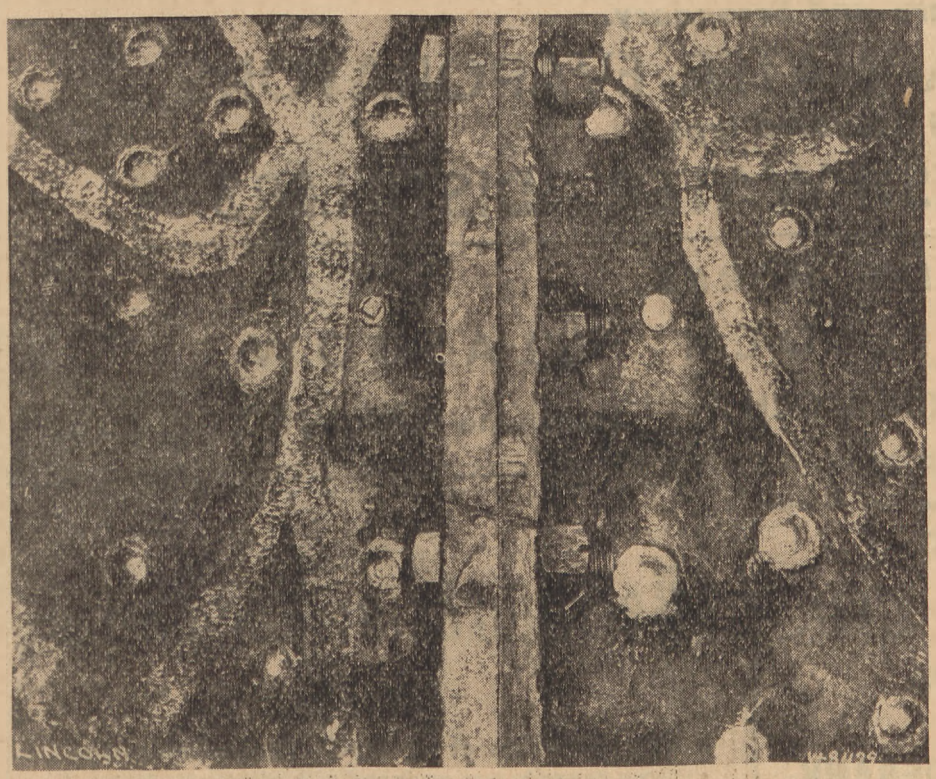
The practice of building up the crankcases and cylinder mountings of oil engines from flame-cut steel plate shows increased resistance to heavy concussive shock when compared with iron castings, but the majority of engine bases and frames are cast.

Not long ago welding specialists were called upon to deal with a large reciprocating marine engine which was sabotaged by her Axis crew. Steel bars had been placed beneath the throws of the crankshaft, which was 19ins. in diameter. When the engine was turned this reduced the bedplate to some hundreds of pieces.



[By courtesy of the Lincoln Electric Co., Ltd..

Repairs to sabotaged engine of Italian ship Villaperosa, showing some of the welds joining broken pieces of cast iron to the main structure of the bedplate, also steel dowel pins holding the steel reinforcing plate in place.

It was estimated that a full year must elapse before the propelling unit could be replaced or even the smashed casting renewed, and it was for this reason that welding was considered to be the only solution if the ship, named the *Villaperosa,* was to be got into reasonably early service in the Allied fleet.

In piecing together the broken parts and tacking them in position after each had been vee'd to an angle of 45 degrees, it was found that several sections were missing, so these had to be replaced. For this steel was used, flame-cut to the required shape. Before the final welding was commenced alignment was checked carefully. No beads were continued for more than 3ins. in order to give time for cooling and prevent any liability to distortion. Finally, steel plates were shaped to cradle the entire bed; these were fitted with steel dowel pins, then welded. This entire job was finished in two months, and it has proved to be an unqualified success.

Sometimes only a day or two can be allowed for quite extensive repairs necessitating continuous welding by relays of operators. These men are held in readiness, together with self-contained portable equipment, to go to any point where their services are needed. The emergency squad, as they are called, have time and again done invaluable work often under conditions which are extremely difficult, to put it mildly. It is all the more remarkable that scientific welding engineers undertaking this class of work are willing to give a guarantee.

The maintenance of many merchant ships, cut off from the normal sources of replacement parts for their machinery, has created problems which time and again, have been met quickly and dependably by scientific welding. It is common practice to build up the journals and pins of crankshafts which have become worn and scored, but even fractured cranks of considerable size have been put right by similar welding methods. Obviously care must be taken in the choice of the correct electrodes, whilst deposits of slag, however small, must be eliminated entirely.

Each layer of welding is inspected minutely after it is put down, and the next run has the valuable effect of normalising the first; this is the reason why multi-layer welding has a finer grain structure. As the last layer is not normalised it is treated as surplus metal and removed, so that what remains is wholly normalised. Crank breakages are usually through a web, and apart from securing a full measure of strength in the weld it is most important to ensure accuracy of alignment, the usual limit being a plus or minus tolerance of 0.001."

A great deal of valuable scientific welding has been carried out upon the cylinder heads of oil engines. Three components of this type were received recently; each weighed two tons and had the water jackets cracked extensively. A temporary repair had been made by fitting patches, but water seepage could not be stopped, and of course the patches were useless in preventing an extension of the cracks. Welding was undertaken at the first opportunity. The fractures were converted into sound metal once more and the holes that had been drilled and tapped to secure the patches were filled in. The metal exposed to the heat of combustion was found to be in good condition but had this not been the case welding could have been applied with the same permanency of result. From the time of receipt until all three heads were ready for refitting required only five days.

Steam engine cylinders are welded from time to time. Sometimes fractures are so inaccessible that portions of sound metal are cut away temporarily so that a perfect weld can be made. Then the section removed is replaced without leaving a visible trace of what has been done.

Some of the most difficult work undertaken by specialists is in regard to condensers. Faulty tube plates are welded with complete success but this work calls for a high degree of skill and experience on the part of the operator. This is due to the extreme care that must be taken to control the expansion and contraction. Smashed end covers are in some respects more simple to deal with but this does not imply that such work can be undertaken lightly and without a substantial basis of knowledge relating to this class of repair.

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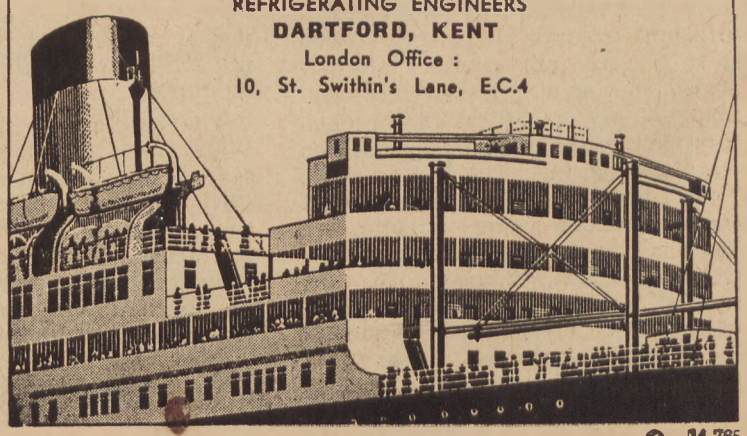
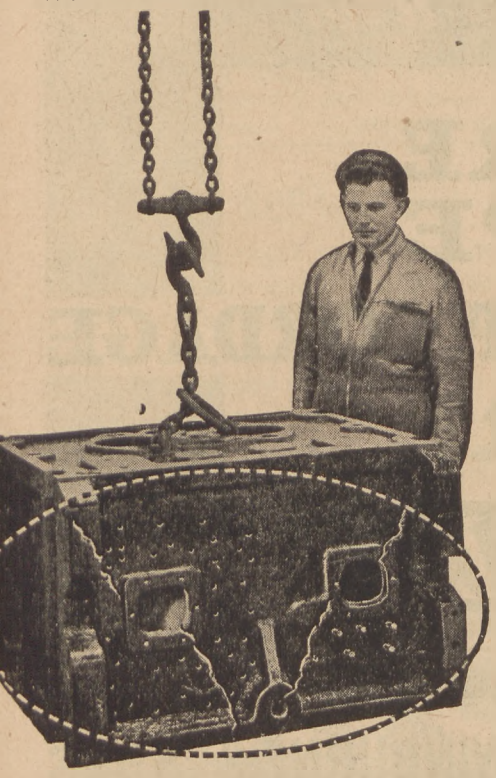


boilers of all types. Good work is being done in the reconditioning of Scotch boilers without removing them from the ship. Normally this might be considered necessary when a furnace must be replaced. A great deal of time is saved by flame-cutting the old furnace into sections convenient to handle and then fitting an entirely new furnace. This is achieved by building the latter in two parts which are welded in position and into a single unit. Work of this kind sometimes avoids a



Cylinder head of ship's oil engine, weighing about two tons, badly cracked on the water jacket. Patching did not effect a permanent repair. The patch holes can be clearly seen.

great deal of supplementary labour such as the removal of top hamper in order to lift out major items of the machinery.

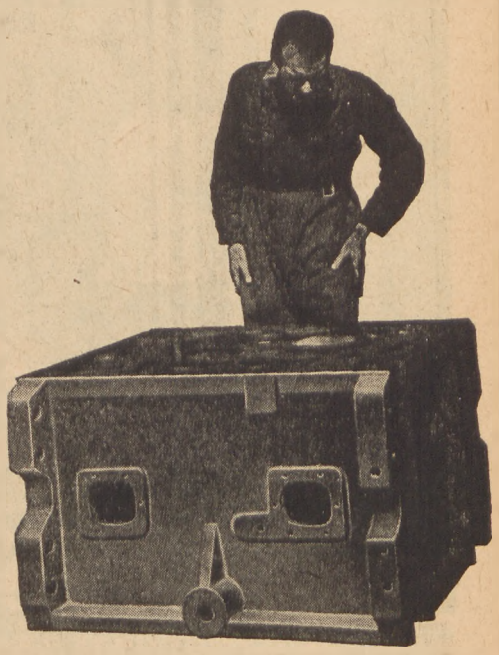
A difficulty which often crops up when dealing with boiler trouble is restricted space. Sometimes this can be eased a little but mostly it is desirable to change the operator at the end of short periods of working. In the case of grooving, however, it may be feasible to build up the weak places by applying new metal externally but the precise position must be determined carefully.

At present some of the most interesting and impressive specialist welding repairs cannot be quoted, but an instance of clever work is that carried out upon the cracked gear casing of a turbine. The fracture was some 4ft. in length through metal an inch in thickness but complicated by the fact that a bearing housing was involved. Not only had a high stress load to be carried but true alignment was a paramount need. The welding was an unqualified success and the job all the more creditable because it was undertaken without removing the damaged casting from the ship.

One aspect of welding that is often overlooked is the improvement in resistance to wear and corrosion that may be imparted to machinery parts that are worn and wasted away. The new metal welded in position can be chosen with special regard to the duty involved, such as hardness to repel abrasion or a neutral reaction to sea water or other influences which may make it difficult to withstand wastage. Results equal to the best galvanising can be secured by spraying zinc or other resistant metal, a wire or powder of which is passed through an oxy-acetylene flame and the molten particles forcibly ejected by compressed air.

One of the newest of all scientific welding processes is that which enables totally dissimilar metals to be welded together regardless of the widest variation on their respective ratio of expansion. The possibilities of this new process are, as yet, but vaguely realised, but undoubtedly the marine applications will be of great importance, particularly in connection with the trend toward reducing the weight of superstructures by the use of light metals, for aluminium and its alloys, including those of the salt water resisting variety, can be welded well and truly to steel.

A vast amount of welding repair work has been carried out upon deck machinery; in fact, in every department of the ship where metal is concerned welding provides an invaluable means for speedy maintenance. In surveying the subject as a whole one is impressed by the almost unlimited opportunities which can be grasped, but not by the inexperienced, for that is the full explanation of indifferent results; hence the desirability of passing on the real problems to the specialist.



The same cylinder head with all cracks repaired and holes filled in by scientific welding, making the jacket as good as when the head came from the makers. This is one of three heads all cracked in a similar way, which were successfully repaired while the ship "turned round" in port.

NEW TECHNIQUE FOR FILLET WELDING

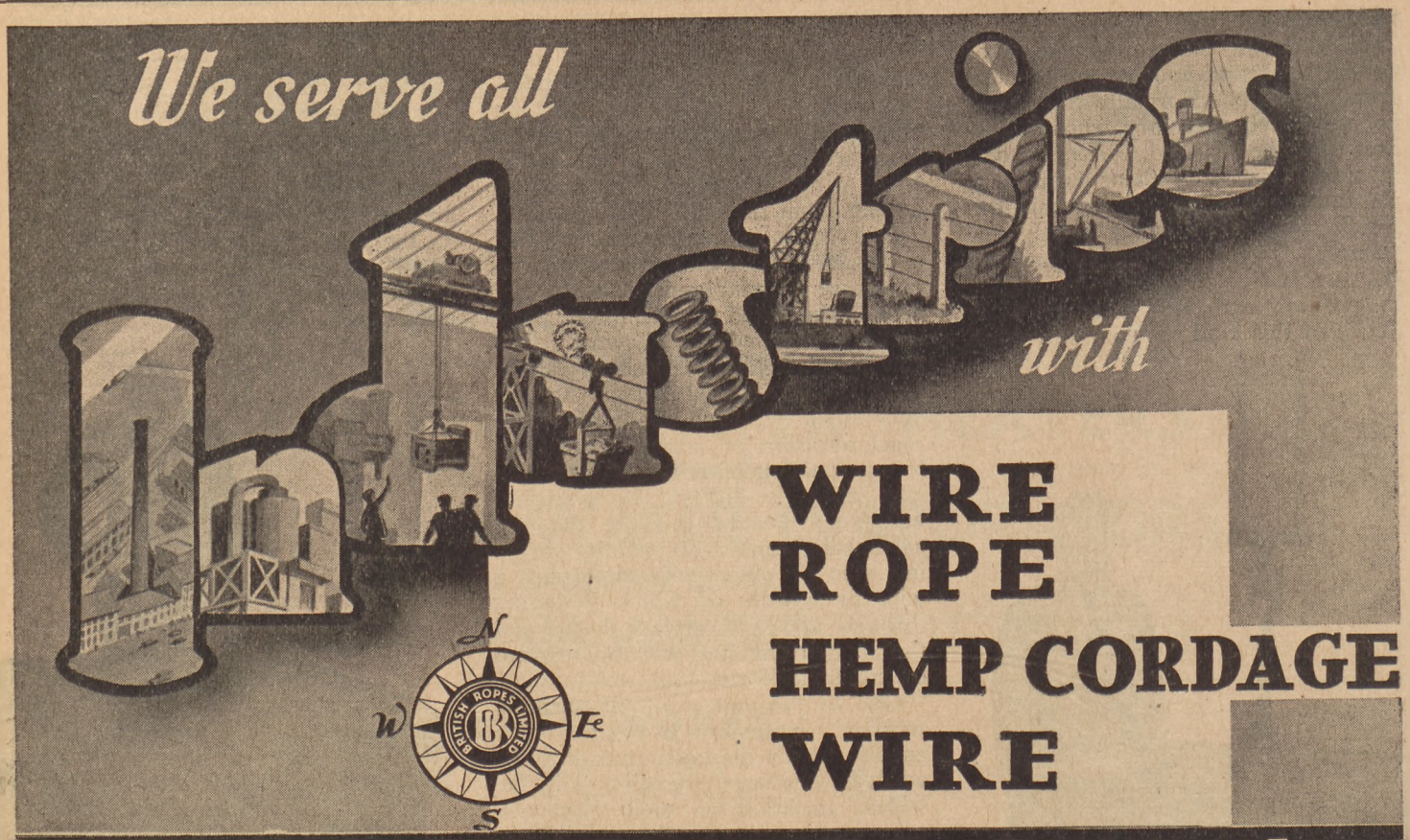
By the Lincoln Electric Co., Ltd,

DURING the past year welding has been used much more extensively in many war industries—particularly in the shipbuilding industry—and in addition to the wider use of welding, more efficient welding methods and procedures have been developed.

There is nothing new in the use of arc welding machines of 500 or 600 amperes, with electrodes of ¼in., 5-16in., and ⅜in. diameter to be used with them, but to obtain the most advantageous results from equipment of this type it is necessary that welding shops and shipyards shall be laid out for welding, and properly equipped. The fastest welding production cannot be obtained unless work is welded in the flat position, and welded ships are now being designed, and yards equipped, to permit flat welding.

More adequate control of arc welding procedures, resulting from increased use and knowledge of welding, has led to the introduction of "Fleet-Fillet" welding—a new arc welding technique approved by the Admiralty and the classification societies. By this technique, developed by Lincoln engineers, considerable depth of penetration can be obtained consistently in fillet welds. It has been established that when using the new procedure with a given size electrode, at a given current, a definite amount of penetration will be obtained beyond the corner of the fillet joint.

This means that there is a greater throat thickness than would normally be obtained, and consequently a "Fleet-Fillet" weld has the same strength as a conventional fillet weld of greater leg length. The new



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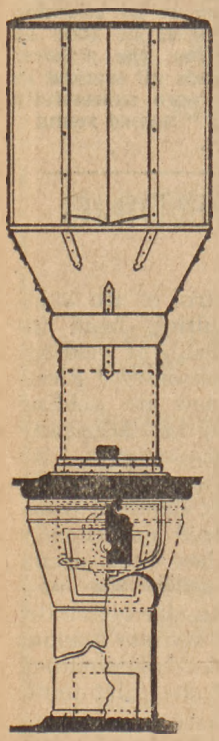

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technique means more feet of weld from each electrode, and a greater output of finished weld joints per day from each welding operator.

About 90 per cent. of the welding in a shipyard is fillet welding, and the Lincoln Electric Co., Ltd., have developed a special type of the "Fleetweld" electrode which gives the maximum degree of penetration when used with the new welding technique.

Much of the work being done in welding armour-plate cannot be discussed here, but it can be stated that armour up to 3ins. thick can be welded, and the welding of armour-plate up to 1in. thick is now commonplace. "Armorweld" electrode has been introduced by the Lincoln Electric Co., Ltd., and the company's engineers have developed a number of welding procedures for different types of work.

A foot control for welding machines has also been introduced. This enables the welding current to be decreased gradually at the end of a run, thereby avoiding craters and possible cracking troubles.

The standard Lincoln "dual continuous" control welding machine is now fitted with a new type of control box which prevents accidental contact with live parts, increases accessibility, and eliminates dangers from unintentional loosening of the lifting hook. Another improvement to ensure continuous operation at maximum currents is the new protective control device which has been incorporated to provide protection against burn-out.

With the influx of new labour into shipyards, particular attention must be paid to accident prevention. This is as true with welding as with other trades, and the Lincoln company have developed special welders' clothing which is flexible, comfortable and provides full protection for the welder. Welding accessories, such as electrode holders, face shields, lenses, cables, goggles and safety curtains are all designed especially for welding to afford maximum protection with freedom to work efficiently.

WELDED REPAIR TO BROKEN STERN FRAME

AN ingenious repair carried out in a British port enabled a ship to be quickly recommissioned without the delay that would otherwise have arisen due to the difficulty of obtaining castings under present conditions. The ship returned to this country with the sole piece of the stern frame, below the propeller aperture, broken off and had no alternative to a new casting been devised, it is probable that the ship would have been idle several months while it was being made.

The expedient adopted was to cut three armour plates to the required shape, allowing for additional vertical welding at the rudder post end of the stern frame, giving an equal strength of weld to that on the forward break of the panel. The centre plate was first welded in position to both ends of the break, after which the plates on either side of this were similarly dealt with. The three plates were afterwards riveted together. A covering plate was then slot-welded to this structure on either side and carried forward to the shell plating.

This ingenious makeshift was duly completed and approved by the surveyors of the classification society concerned and of the Ministry of War Transport. The repair was carried out by Messrs. Harland and Wolff, Ltd., in consultation with Mr. C. G. Guthrie, the superintendent engineer of the Lamport and Holt Line. (See illustration on Page 239.)

LINCOLN "FLEET-FILLET" WELDING

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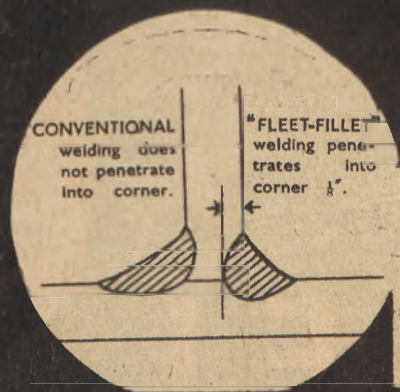

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STEEL

PROGRESS IN METALLURGY

THE position in regard to research and experiment of a technical and metallurgical character has changed considerably since the last review appeared in the pages of this magazine. The war has become world-wide, large areas of former British territory are in enemy possession for the time being, and in consequence supplies of much needed raw materials, e.g., sisal and rubber, tin and teak, are in danger of shortage. Not only, therefore, has much research and experiment necessarily been devoted to the development of substitute materials but also, as so many of the world's inquiries are now wholly directed to the furtherance of the war effort, it is difficult to publish the results, where these are publishable.

In these circumstances, it cannot be expected that the details given in the following paragraphs will cover any sensation and revolutionary secret progress. Nevertheless, the information given relates to important advances, all of which deserve careful attention for the shadow they cast as an indication of approaching developments, and for the suggestions they offer of future possibilities.

Some of the most interesting progress has been with the stainless steels.

An alloy of this type that is finding increased application is the 16/13/3 steel, containing 16 per cent. chromium, 13 per cent. nickel, and 3 per cent. molybdeunm. This has, in addition to good corrosion resistance, extremely valuable high temperature properties. It withstands oxidation under continuous service up to at least 910 degs. Cent.

The treatment of the austenitic 18/8 stainless steels with nitric acid has been known for some time to have the effect of improving both the surface appearance and the corrosion resistance of these steels, and "passivation treatment," as it is termed, of this kind is a recognised stage in commercial finishing practice. It has now been discovered that passivation of 18/8 steel is similarly produced as a result of treatment in hydrochloric acid solutions (3N to 12.5.N) containing an inhibitor, which may be either a commercial compound or quinolin ethiodide.

Interesting possibilities are suggested by the employment of nitrogen as an alloy to reduce the amount of nickel required in the stainless steels. It has been ascertained that a high chromium steel with an austenitic structure is obtainable when nitrogen is introduced, using very little nickel, if the carbon is below 1 per cent. A steel of this type contains on average 0.06 per cent. carbon, 23 per cent. chromium, 3-5 per cent. nickel, and up to 0.03 per cent. nitrogen. The carbon content must not exceed 0.06 per cent. Such a steel can be cold worked and will withstand long-period annealing. It has a remarkably high elastic limit and deep drawing properties. Its resistance to oxidation and corrosion is fully equal to that of 18/8 stainless steel.

A patent process for surface hardening stainless steel is claimed to produce superior wear-resistant qualities in stainless steel and stainless iron without any sacrifice of their innate resistance to corrosion. In this process, the steels are submitted to a treatment utilising the nitrogen content of anhydrous ammonia vapour.

There are four stages of the process. In the first, the steel surface is prepared by careful cleansing; secondly, it is placed in a muffle, heated by electricity or fuel, and adequately supported to prevent distortion. Next, the muffle is sealed and the gas flushes the container until all traces of air have been eliminated. The muffle is then heated as the flushing gas flows until the temperature reaches 565 degs. Cent. A regulated flow of ammonia vapour is then introduced into the muffle after a previous activation in an ioniser, and the process is carried on for a period governed by the depth of hardened case required. The muffle is then cooled under the flushing gas to a low temperature.

Submarines are widely employing nickel alloys for various items of their equipment. Valve and pump parts, windlass and gears, firing and other control elements, are being made from high nickel-copper and nickel-copper-aluminium alloys. Roller and ball bearings for special duty employ the latter metal. Lubricating fittings, and large springs for the control of important valves, use both high nickel-copper, high-nickel-copper-aluminium, and high-nickel-copper-manganese alloys. The high nickel-copper alloy is also used for acid-proof battery boxes and tanks for distilled battery water.

Another interesting use of these nickel-copper corrosion-resisting alloys is in connection with cable ships for laying cable. Here, it has been used for the protective sheathing of the terminal length of the cable on account of its strength, toughness and high resistance to wear and corrosion. The cable is always subject to corrosive effects from both air and salt water.

A new type of holds for trawlers has been developed in the United States, and makes great use of these same nickel-copper alloys. The holds are sheathed with wood lined with a nickel-copper alloy sheet 20 gauge thick. These sheets are applied directly to the heavy wood sheathing, and the hold is further insulated by a lining of 6ins. of cork between "ceiling" and hull. Each sheet is secured to the wood along two edges only by means of nickel-copper alloy nails. Joins between the sheets are lock-seamed and then bent back over the nail heads and soft soldered, in which way a completely closed and sanitary joint is formed.

The heavy insulation against heat transfer in warm water saves ice for packing the catch, an important factor where trawlers in warm waters have to be away from port for a considerable period. Fish carrying capacity is thus increased, spoilage due to contamination by bacteria minimised, and salt water can be used for washing and flushing out the holds after each trip.

Flame cutting and electric welding are very much in the limelight in regard to shipbuilding. It has been said that half the merchant vessels now being built are all-welded. Welding fabrication has, in fact, been developed to provide a method for shaping parts of all sizes and contours from steel plates and slabs at a cost within reasonable bounds. Flame cutting is used for shell plating, &c., which require double and single bevel joints. Pipe flanges and plate collars are flame cut. Floors and parts such as access openings in inner bottoms are being flame cut in multiple cutting machines. Oxy-acetylene gas is also being applied to the annealing of flame-cut surfaces on alloy steels of great hardenability that have later to be machined or cold formed.

A special electrode has been developed for repairing defects in propellers and other manganese bronze castings, such as valve bodies. Rudders, shaft struts and stern weldments are preheated in electrical strip heaters and then welded. Stainless steel deck coverings, coamings, and galleys are welded, as are fire-resistant superheater supports made from a steel containing 25 per cent. chromium, 20 per cent. nickel.

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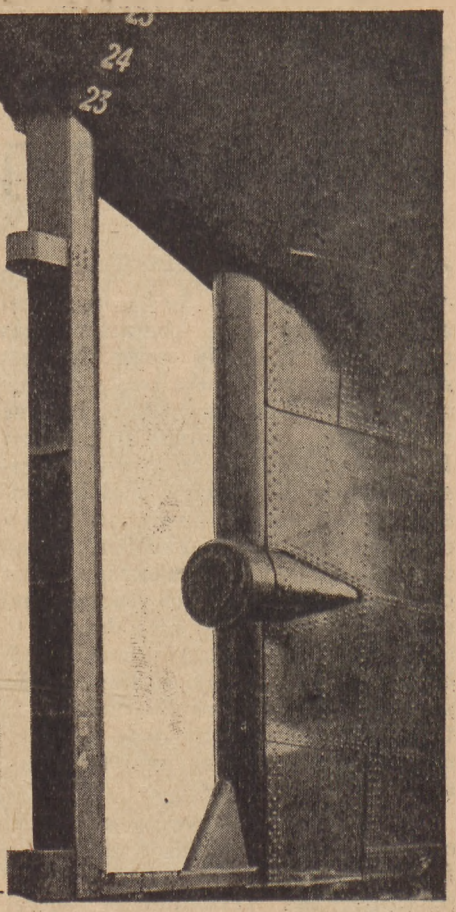

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One of the most striking advances in powder metallurgy is the production of a copper-nickel bonded babbitt bearing, designed to give greater strength than the tin-base babbitt metal and a higher resistance to corrosive action than the ordinary lead-base bearing metal. This new bearing comprises a steel base on to which is bonded a copper-nickel sponge layer formed by powder metallurgy, the sponge layer being impregnated with a bearing metal.

Propeller blades are being manufactured for seaplanes from seamless cold-drawn tubes of nickel chromium molybdenum steel containing 0.3 per cent. carbon, 1.75 per cent. nickel, 0.8 per cent. chromium, and 0.25 per cent. molybdenum. The tube is internally polished, swaged and flanged on the shank end, and lathe-turned to correct wall thickness on a mandrel. A diaphragm is welded into the large open end, and water injected through a pipe connection at the flange end and maintained under pressure while the tube is bent.

Corronizing is a new process designed for producing composite coatings on parts of outboard motors, tanks, oil cans and wires, &c. It comprises the application of electro-deposited nickel and zinc on nickel and tin, and heating the coated article to ensure diffusion of the layers. A bright coating giving a finish equal to that of wiped hot galvanised wire and much more durable can be obtained.

Particular importance attaches to the discovery that bismuth added to stainless steels renders them much more machinable. Many attempts to produce a free-machining stainless steel have been made in the past. Sulphur and selenium achieve this end, but only at the cost of some sacrifice of corrosion resistance. Silver is erratic in results because of the difficulty of obtaining uniform suspension of the silver in the molten metal. Lead helps, but is difficult to introduce into stainless steel castings.

Bismuth, however, is readily added to steel under commercial conditions, and produces improved machinability without any decline in corrosion resistance. The strength of the castings at 980 degs. Cent. is not impaired by bismuth, but ductility at this temperature is somewhat less. Galling resistance is considerably increased, a factor of importance in connection with valves, gears, pumps, &c., and weldability is in no way affected.

A range of facing alloys for resistance to wear and corrosion has been developed. These contain diamond-like crystals of chromium boride distributed through a hard metal matrix and imparting to the overlay a high degree of resistance. Different qualities to meet particular requirements have been produced by adopting different metals as bases. Thus, a nickel base provides a product highly wear-resistant and corrosion-resistant, while a steel base gives increased resistance to impact and abrasion, as well as, in some instances, a raised corrosion resistance.

These alloys may also be cast on, and this method has advantages where the job is of such a character as to allow it. Where a number of identical parts have to be hard-faced simultaneously, much time is economised, and a smoother surface obtained, which results in an economy in machining time.

Sirens, alarm bells, and similar apparatus must function efficiently, and this depends to a great extent on the effectiveness of the flat reaction springs and their length of life. Nickel is now being used in America for these springs, and is said to give double the life as compared with springs made from any other metal. Nickel copper alloy is used for the striker rods because it does not upset when striking the bell, and is not subject to corrosion. Signal horn diaphragms, formerly manufactured from cadmium-plated steel, are now being made from a nickel copper alloy, and the need for plating has thus been eliminated.

Damaged German and Italian cargo vessels taken over by the United States have been rapidly repaired, and this work has been greatly facilitated by bronze welding, which has been extensively employed for repairing the cylinders, cylinder heads and valves of the main engines, as well as for fire pumps, air pumps, feed pumps, foundation columns and steering engines. Many of the repairs have been made with the castings in place, and bronze welding is extremely advantageous for work of this kind. It uses a relatively low temperature, so that contraction and expansion are minimised, while stresses normally set up by the heat of the welding operation are largely avoided by using special welding methods.

In another instance, a large shipbuilding yard working on high pressure steam installations needed to weld steel flanges to the ends of 4in. internal bore seamless steel pipes. High steam pressures had to be withstood without leaks, while joints had to be strong, malleable and unaffected by fluctuating temperatures. The work was satisfactorily done by oxy-acetylene welding with suitable welding rods, a generous chamfer being provided to allow of penetration of the deposit to the root of the joint area, thus making deposition easier and ensuring high strength.

A series of alloys able to resist high temperatures (1200-1300 degs. Cent.) has been developed. These contain 25 per cent. chromium, 5 per cent. aluminium, and 60 per cent. iron; 52 per cent. iron, 30 per cent. chromium, 8 per cent. aluminium, and 10 per cent. molybdenum; 65 per cent. iron, 25 per cent. chromium, 5 per cent. aluminium, and 5 per cent. molybdenum; and other similar compositions are available.

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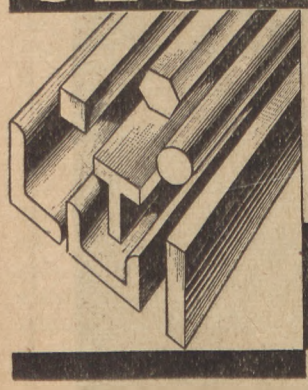

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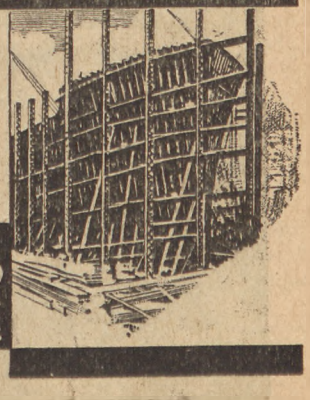

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By E. H. SMITH,
M.I.Mech.E., M.Inst.N.A.

MARINE STEAM MACHINERY REACHES A CRITICAL STAGE

MARINE steam machinery has reached a critical state. The intense developments of the past 15 years are now being witnessed in a completed perspective so that the ultimate possibilities can be gauged and the extent to which they are utilised may have far-reaching effects upon the status of British shipping after the war.

The outlook is of particular significance because the closest parallel exists between the present situation and the circumstances that existed in the corresponding period of the last war. The practicability of the steam turbines for ship propulsion was demonstrated in the Clyde river steamer *King Edward VII.* in 1901, and thereafter, in succession, followed their use in larger ships to culminate in 1906 with the construction of the *Lusitania* and *Mauretania*. The success of the introduction of mechanical gearing in 1910 in the *Vespasian* removed the handicap which the turbine had suffered through its direct association with the propeller and a new era of efficiency with the geared turbine that was applicable to all classes of shipping had been opened, so that an extensive development in this direction might have been expected but for the outbreak of war in 1914.

The first double reduction geared turbines built in this country were fitted in the *Somerset* in 1918, and the success of this further advance has been fully reported by Dr. S. F. Dorey in last year's notable Parsons Memorial Lecture. The opportunity offered by this elaboration was demonstrated in further installations such as the machineries of the *Cairnross*, also in the larger vessels such as the Orient Line post-war liner programme starting with the *Orama*, built in 1922, which for that time attained a record fuel consumption of .785 lb. of oil per s.h.p. hour, with steam conditions of only 215 lbs. pressure and 150 degs. Fahr. superheat. But, through inattention to the finer points of detail in mechanical design and technique, there were such repercussions that steam propulsion received a set back from which it was only slowly recovering before the outbreak of the present war.

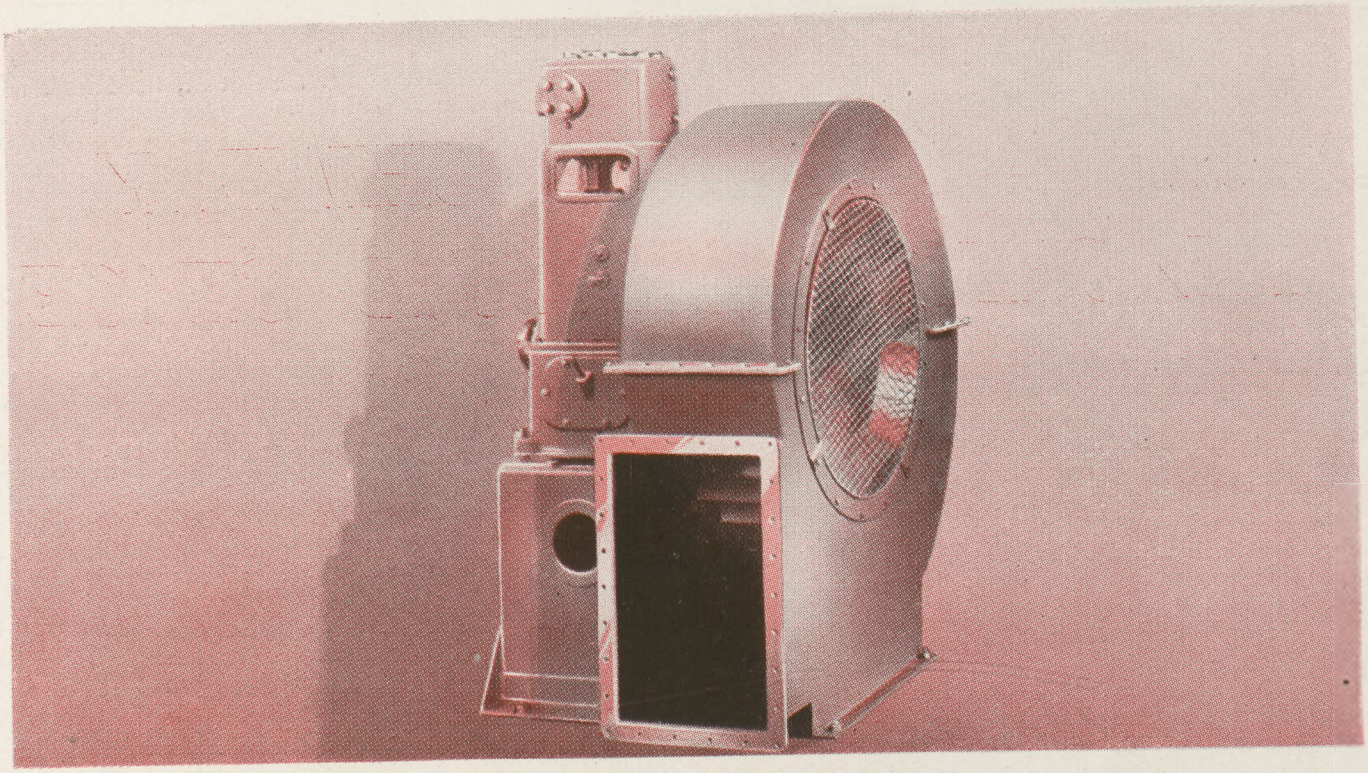
Just as the *King Edward VII.* preceded the last war by 13 years, so, by the same period before the commencement of the second conflict, in 1926, the pioneer installation of high pressure marine turbine machinery was fitted in the *King George V.* to illustrate the economical effects of employing the more advanced thermal conditions of 550 lbs. pressure and 750 degs. Fahr. temperature. Within a short time Mr. John Johnson was showing the practicability of high-pressure steam machinery for ocean-going ships in the distinguished series of Canadian Pacific liners that started with the "Duchess" class of vessels; machinery on generally similar lines with geared turbines, or turbo-electric drive, and various types of boilers working at pressures of 400 to 450 lbs. and 700 to 750 degs. Fahr., has been widely accepted for power outputs from 15,000 s.h.p. up to the highest powers required for express liners like the *Queen Mary*, *Queen Elizabeth* and *Normandie*.

In this way the space required to accommodate the propelling machinery in such ships has been halved and the steaming weight of the machinery more than halved during the development period of 13 years, while the reliability of such arrangements has been sufficiently well proven during this time that a further step forward is overdue. The position that steam propulsion occupies to-day with the machinery types that have been developed along these lines provides an oil fuel consumption rate of about .57 lb. per s.h.p. hour, which represents an improvement of 25 per cent. on the performance of the most efficient low-pressure marine turbine machinery, as exemplified by the *Orama*. In addition to the gain from higher pressures and temperatures, further benefits accrue from a combination of factors such as higher boiler efficiency, more efficient auxiliaries, improved feed heating arrangements and other influences from which little further improvement can be expected. Future advances will be directed largely to the employment of higher pressure and temperature conditions.

The encouraging progress that was accomplished with the earlier high-pressure steam machinery installations led almost immediately to proposals for the employment at sea of forced circulation steam generators working at super-pressures with extreme temperatures, and among the actual installations of these types tested out was the Benson boiler working at critical pressure in the *Uckermark*, the Loeffler boiler installation working at 1,850 lbs. pressure and 890 degs. Fahr. temperature in the *Conte Rosso*, and the Sulzer monotube boiler working at 1,500 lbs. pressure in the *Kertosono*, but the results of these experiments did not appear to justify the complications that were involved.

At the present time the concensus of technical opinion appears to favour a progressive advance in working pressure by easy stages within the limits of initial temperature permitted by the available materials of construction. A suitable combination of pressure and temperature should be employed so that the wetness fraction in the later stages of expansion does not exceed a prescribed limit or else there will be excessive deterioration of the turbine casings and blading by erosion. High temperature steam expanding through a turbine gradually loses its superheat and begins to condense partially with the formation of moisture that separates out and tends to be thrown by centrifugal action towards the casing to pass through the blading with a relatively slow axial velocity so that there is an impact on the blades to cause loss of power and the wasting action that has been described.

Steam conditions of about 425 pounds initial pressure and 700 degs.



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Fahr. temperature, expanding down to 28½ins. vacuum, result in about 10 per cent. moisture at exhaust, which is the most that is considered to be allowable for satisfactory maintenance of the turbine units over the life of the ship. The percentage wetness in the exhaust with different initial temperatures at various working pressures for a turbine efficiency of 78 per cent., is shown in Figure 1, and from this it is possible to draw the diagram of Figure 2, which shows the minimum steam temperature that should be employed with any initial pressure if the moisture at exhaust is to be within the prescribed maximum of 10 per cent. A correction to this curve is required for any difference in turbine efficiency from the value for which the diagram has been prepared.

While the efficiency ratio of marine turbines as employed at the present time for marine service is about 78 per cent., values of 82 to 85 per cent. are obtained in land installations, and improvements in details of design should enable marine units to approach closer to these figures. On the other hand, the greater parasitic losses at the turbine glands and in other directions with small units result in lower efficiency ratios with turbines of reduced outputs suitable for slow speed vessels. The derived curve, however, provides a useful basis from which general conclusions can be drawn. Some progress along these lines has already been made with the machinery installations shown in the accompanying table.

Ship.	S.H.P.	Type of boiler.	Pressure. lbs.	Temp. Degs. Fahr.
Potsdam ...	26,000	Benson	1,325	878
Scharnhorst	26,000	Wagner	710	845
Niew Amsterdam	34,000	Yarrow	600	750
E. J. Henry	5,000	Babcock	625	925
Pretoria ...	14,000	Benson	1,135	897

War conditions have limited the amount of service data available from these ships, but it is known that no serious mechanical difficulties have been encountered. It is too early to say that the degree of reliability provided is sufficient for passenger line requirements. It is of interest, though, to observe how the steam conditions employed conform generally to the trend of development suggested by the curve of Figure 2, on which the working temperatures for these installations are indicated. The particular exception to this general conclusion is the relatively high temperature employed with the machinery of the Atlantic Refining Co.'s tanker *E. J. Henry*, which, it will be observed, conforms more generally to the trend of advance suggested by Mr. John Johnson, in the eighth Thomas Lowe Gray Lecture on the future of steam propulsion, as a result of the experience acquired in the high pressure machinery installations of the Canadian Pacific liners, where it has appeared desirable to limit the moisture at exhaust to about 6 per cent.

Taking an intermediate view between the trends suggested by the two curves of Figure 2, it is of immediate interest to observe that designs have been prepared for putting into early operation of a straightforward geared-turbine installation of 16,000 s.h.p. output to work with 500 lbs. pressure and 800 degs. Fahr. initial temperature, as shown by the reference 8 on the diagram.

Adoption of working steam temperatures in excess of about 750 degs. Fahr. will in general involve the employment of special materials for the parts of the machinery that are exposed to the full initial conditions. Mild steel can be safely used for steam temperatures as high as 850 degs. Fahr., but provision must be made in marine installations for sudden rises in temperature, up to 50 degs. or even more, under extreme conditions. This has no very important effect on the

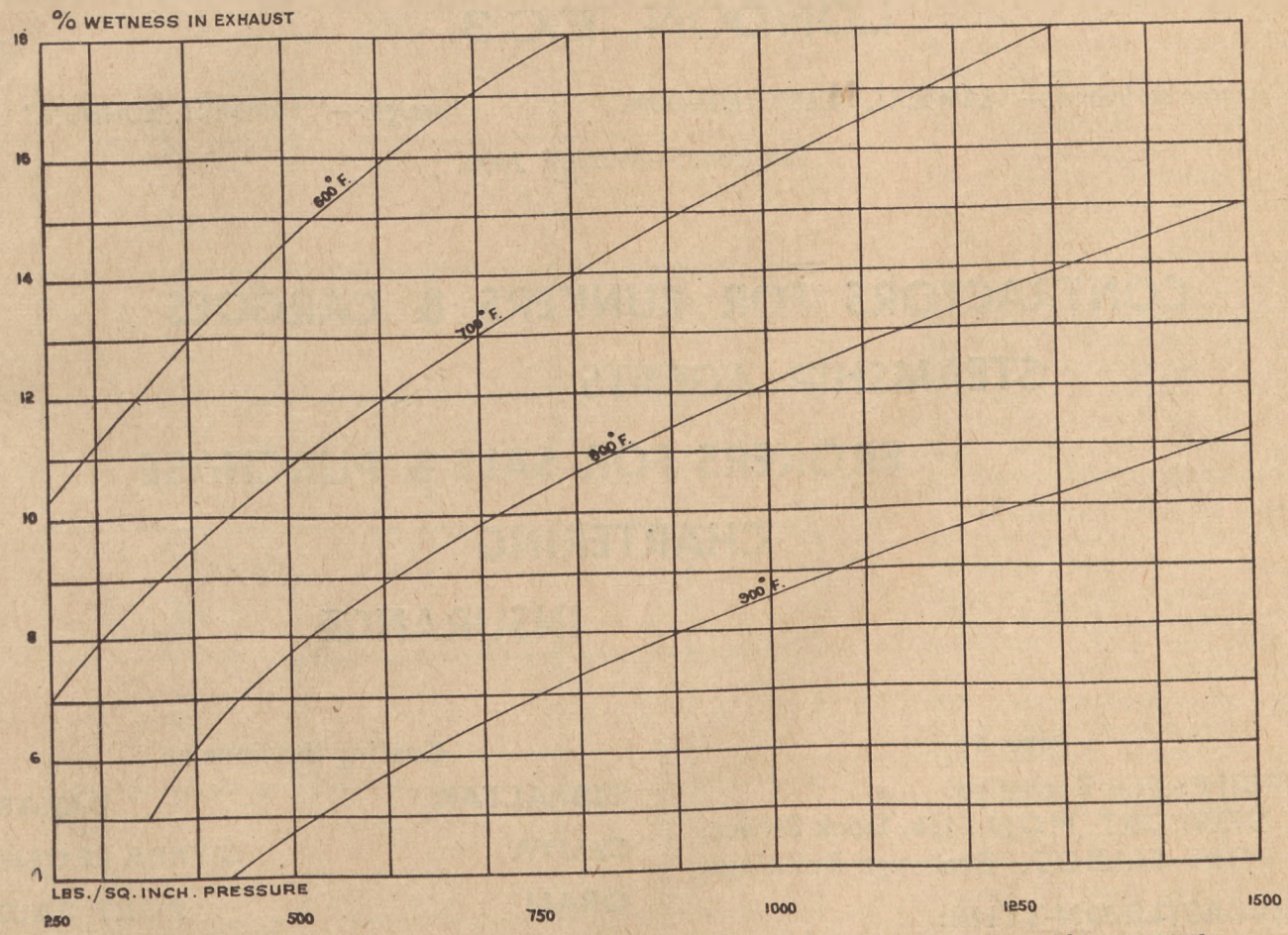

Fig. 1—Percentage wetness in exhaust with different initial temperatures at varying working pressures.

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strength of materials while temperatures of about 750 degs. Fahr. are being employed, but for temperatures above 850 degs. Fahr. there would be an alarming loss of strength due to comparatively small increases of temperature.

Alloy steels that are easily capable of withstanding the highest temperatures which are likely to be employed are available for use where the circumstances demand it but, before proceeding to this extreme step, it seems likely that interest will be focussed upon controlling the temperature conditions so that undesirable fluctuations are unable to occur and this is being provided for in proposals that have been prepared to utilise separately fired superheaters. The provision of independent oil burners in association with radiant heat superheaters enables the final steam temperature to be controlled within the finest limits. Automatic superheat control can also be provided for by superheating the steam in separate stages and developments along one or other of these lines will play an increasingly important part in future operations.

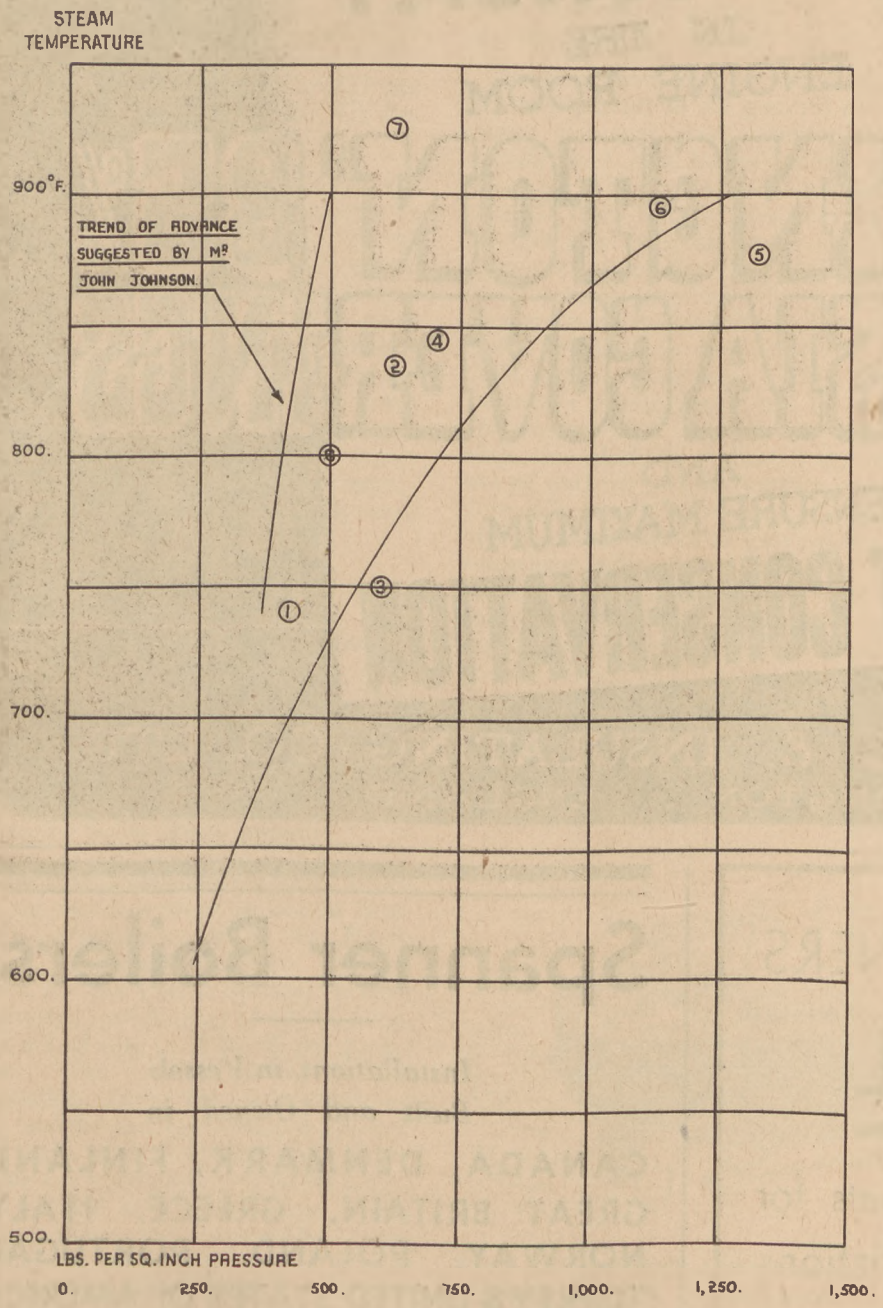

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Fig. 2—Initial temperatures to obtain .9 dryness fraction at exhaust with different working pressures (turbine efficiency = 78.5%)

Manoeuvring conditions that are peculiar to marine service must be given special consideration as advanced steam conditions are adopted since the astern turbine of geared units is ordinarily exposed to exceptionally severe strains during sudden reversals, and it seems likely that separate casings will in future be provided for this unit where elevated temperatures are being employed. The adoption of electric drive eliminates this difficulty since reversal of the propeller can be obtained without changing the direction of turbine rotation. This was, doubtless, one of the points in mind when the Norddeutscher Lloyd tried out the merits of the rival systems in their pre-war high-pressure liners *Scharnhorst* and *Gneisenau*, each working with the similar steam conditions of 710 lbs. pressure and 845 degs. Fahr. steam temperature. It is also significant that turbo-electric drive is being employed in the Atlantic Refining Co.'s tankers working with an initial steam temperature of 925 degs. Fahr., which is the highest yet employed with marine machinery.

An alternative line of development in the approach to higher thermal efficiencies with marine steam machinery is the employment of reheating when relatively high pressures can be employed with a comparatively low initial temperature and when the steam has been expanded to an appropriate stage it is resuperheated to give the required minimum wetness at exhaust. The possibilities in this direction were fully dealt with in the exhaustive paper read by Messrs. Fox and Tingey before the Society of Naval Architects and Marine Engineers, New York (fully reported in *The Journal of Commerce and Shipping Telegraph* of January 8 and 15, 1942), in which was described the experimental 8,000 s.h.p. installation of reheat machinery being tested out in the United States Maritime Commission steamer *Examiner*.

In this ship steam is generated in natural circulation boilers at 1,200 lbs. pressure and superheated to a total steam temperature of 740 degs. Fahr. The steam is expanded through the high-pressure turbine when the temperature is restored to 740 degs. Fahr. temperature in a separately fired reheating element before expansion down to the condenser pressure. The moisture at exhaust in these circum-

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stances is approximately the same as would obtain with a direct expansion turbine working with an initial steam temperature of 940 degs. Fahr. No operating data from this installation has yet been made available, but the fuel consumption rate is calculated at .513 lbs. of oil per s.h.p. hour, which represents a saving of about 12½ per cent. on steam conditions of 425 lbs. pressure.

Provision of independent firing for the reheating element provides a measure of protection during manoeuvring conditions and astern running when there will be no steam flow through the ahead turbine since the fuel supply can be automatically shut down, but the residual heat in the boiler settings is liable to cause overheating. Another suggestion for protecting the reheater during astern running is to provide a special connection for circulating steam at such times through the tubes.

Alternatively, a steam reheating installation can be employed with the elimination of all complications in the boilers, and piping, but such systems must be less efficient than reheat by the products of combustion in the boiler, since the temperature of reheat using live steam is limited to the saturation temperature corresponding to the boiler steam pressure.

The reheat experiments were carried out on the *Examiner* to obtain first-hand information with the P.4.P. design of passenger liners contemplated for the Pacific service, to have machinery installations of 58,000 s.h.p. with a fuel rate of .5 lb. oil per s.h.p.-hour. The studies carried in this connection from the standpoint of cost, weight and performance showed that while such proposals were practicable for installations of 8,000 s.h.p., and justified at approximately 10,000 s.h.p., they are noticeably more economical for installations of 15,000 s.h.p. and above. In fact, most of the developments outlined in the foregoing will find their application in the latter class of vessels which, for well understood reasons, will rely on oil as fuel, and represents a small proportion of the aggregate tonnage required to carry out sea trading requirements.

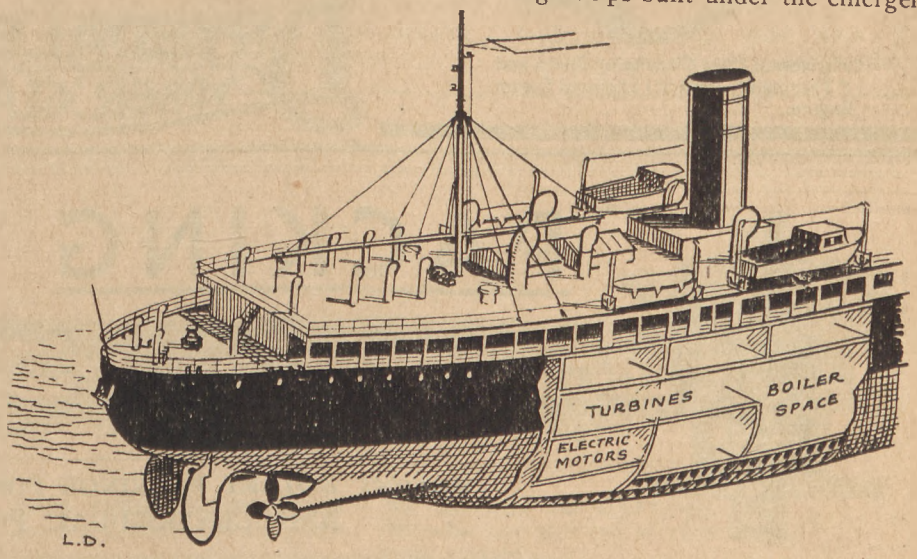
One of the most urgent problems that will confront British shipping at the conclusion of hostilities is the question of fuel supplies, and it is being increasingly realised that the choice between steam or oil engine propelling machinery is a secondary matter and that the major issue lies between the choice of coal or oil as fuel when steam machinery holds an exceptionally strong position by virtue of the ability to use indigenous fuel, or coal or oil at option; this applies to nearly 90 per cent. of the world tonnage employed in tramping or on liner services, for the carriage of cargo.

Improvements in steam machinery as usually fitted in the general run of cargo tonnage have reduced the specific fuel rate for propelling purposes by 25 to 33½ per cent. during the past 20 years but, in spite of this, as matters were standing at the outbreak of war it seemed that the prospects for an extended use of coal as ship bunkers were diminishing. The principles involved in the problem were dealt with exhaustively in Mr. John Johnson's classic paper of 10 years ago dealing with fuel for merchant ships, in which he indicated that the use of coal with modern steam machinery will show a margin of advantage in the general run of cargo vessels, but something rather better than what has generally been fitted in this class of shipping is required. The performance standards obtained with the usual machinery types using coal as fuel in cylindrical boilers, with hand-firing, is roughly :—

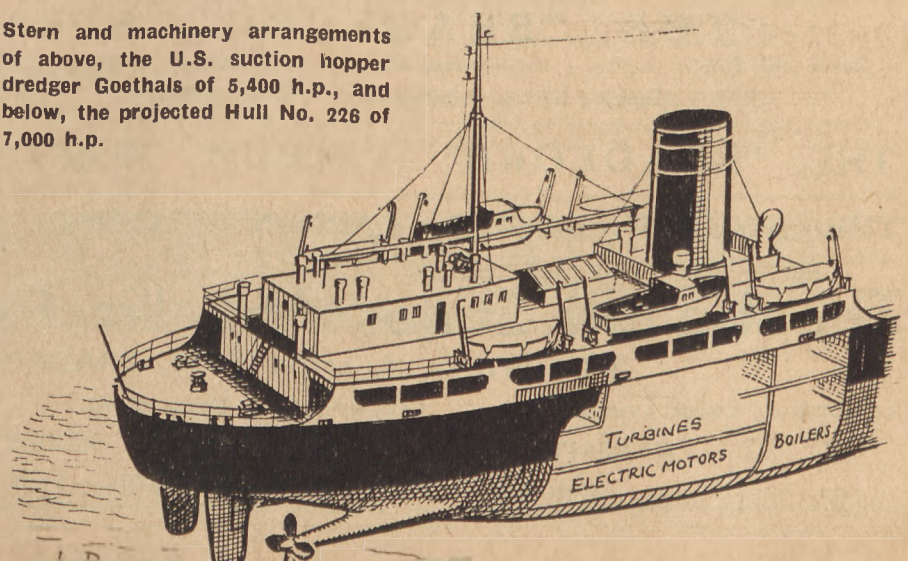
	Lbs. per s.h.p. hour.
Reciprocating engines with 200 degs. Fahr. superheeat	1.4
Reciprocating engines with reheat	1.25
D.R. geared turbines with 200 degs. Fahr. superheat	1.2

The scope for further improvement is very restricted apart from the economy offered by proceeding to higher pressures and temperatures, involving the use of geared turbines and water-tube boilers. It seems improbable that extreme conditions in these directions can be safely employed with low powered units, since leakage at the blading, glands and dummies assumes a considerable importance. It has been calculated that maximum efficiency for a 2,000 s.h.p. unit obtains at a pressure of 450 lbs., about 550 lbs. pressure for a 5,000 s.h.p. unit and for a 10,000 s.h.p. unit at about 750 lbs. pressure.

Practical advantages of adopting pressures of about 450 lbs., with steam temperature of 750 degs. Fahr. have already been demonstrated in the cargo ships built under the emergency



Stern and machinery arrangements of above, the U.S. suction hopper dredger Goethals of 5,400 h.p., and below, the projected Hull No. 226 of 7,000 h.p.



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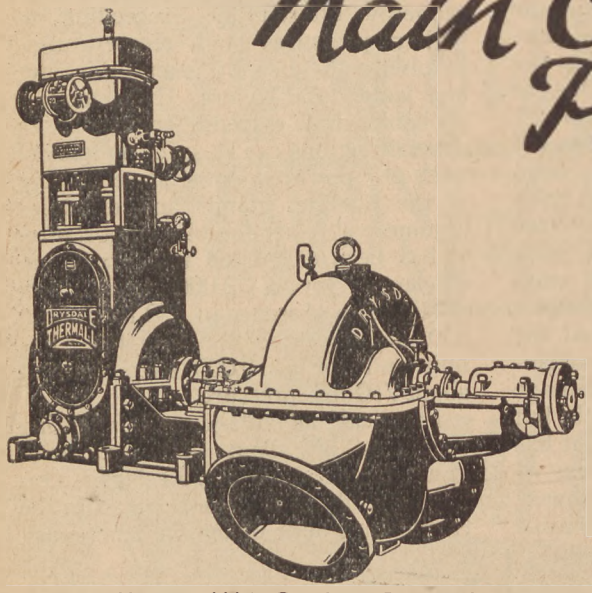

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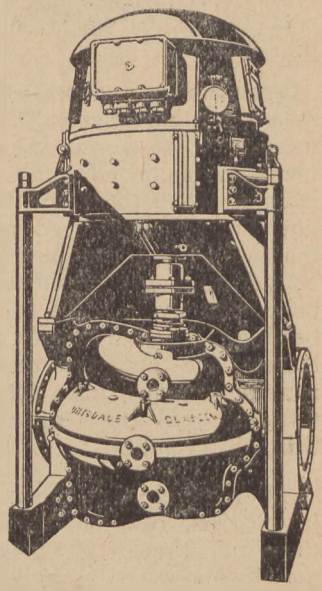

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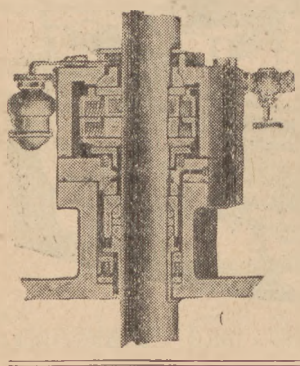

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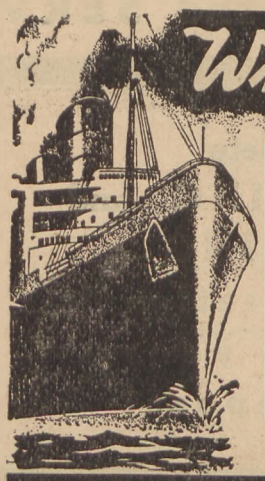
programme of the United States Maritime Commission. The greatest deterrent to the use of higher pressures, involving the employment of water-tube boilers in cargo ships, has been the unwarranted difficulties anticipated in regard to suitable water supplies but it is often overlooked in this connection that the weight of water in a 2,500 h.p. boiler installation only amounts to eight or nine tons by comparison with about 75 tons in corresponding cylindrical boilers. The adoption of turbines eliminates feed troubles at sea that emanate from the presence of oil in the condensate, and the present technique of condenser design and construction has almost entirely eliminated the risks of feel contamination by sea water.

Hand-firing of coal fuel involves a loss in efficiency of 8 to 10 per cent., and the realisation of this has led to many attempts during the past 50 years to automatic firing of cylindrical boilers with only a limited measure of success, but the solution is immediately provided by the adoption of water-tube boilers. There is a considerable divergence of opinion about the relative merits of pulverised fuel firing and mechanical stoking of water-tube boilers in power stations ashore, but mechanical stokers have been more generally favoured for marine work as shown by the very successful installations of the Koninklijke Pakevaart Maatschappij, the Canadian Pacific cargo steamers of the Beaver class, among others, and most recently the twin-screw British India steamships *Amra* and *Aska* fitted with geared turbines of 9,000 s.h.p. supplied with steam from stoker-fired, coal burning, water-tube boilers of 450 lbs. pressure and 750 degs. Fahr. temperature.

The silence imposed by the exigencies of war has prevented the results obtained with the last two of these installations being published, but it is an open secret that they have been exceptionally successful. The designed fuel rate, with Indian coal of 11,000 b.t.us. was 1.15 per s.h.p. hour, corresponding to about 20 per cent. thermal efficiency, and the attainment of this characterises these installations as the most efficient coal burning marine machinery plants yet built. This performance corresponds to a normal fuel rate of .9 lb. of coal per s.h.p. hour and, since the vessels have twin-screw machinery, the performance could be duplicated in a single-screw installation of 4,500 s.h.p. that would be suitable for many ordinary cargo liners.

An outstanding example of the flexibility of mechanical stoker firing to water-tube boilers is provided by the experience of their use that has been acquired on the British cross-Channel steamer services during the past decade. The pioneer installation of this type was a partial conversion carried out in the L.M. & S. Railway steamer *Duke of Lancaster* on the Heysham-Belfast service, in 1932, when the net results were to increase the output of the converted boilers by 25 per cent., improve efficiency by 7½ per cent., while permitting the use of a cheaper grade of fuel and to enable this cheap slack being burnt smokelessly, so that the system has become universal for the services working from terminal ports where suitable coal bunkering facilities are available.

Much new information on this matter has been made available in Major Gregson's Thomas Lowe Gray Lecture of last year, including particulars of the new Southern Railway Company's steamer *Invicta,* ordered just before the outbreak of war, to operate on the Folkestone-Boulogne run, in which steam for the 12,000 h.p. machinery is provided by two Yarrow boilers, burning coal with Taylor mechanical stokers, which effectively



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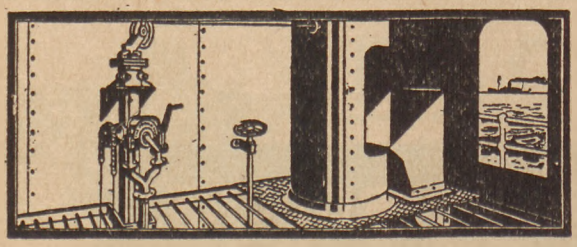

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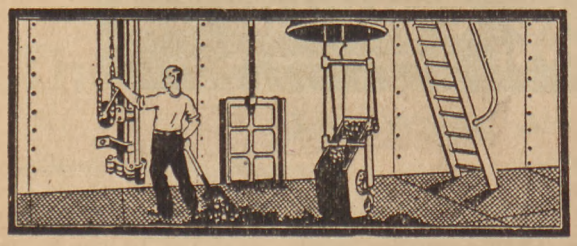

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illustrates the advantage of automatic firing in permitting the use of high capacity steam generators.

An inheritance from the hand-firing of coal fuel, and the limited capacity of cylindrical boilers, is the idea that a number of units is necessary to provide the degree of reliability which is essential in the machinery of ocean-going ships. A single water-tube boiler will meet all the propelling requirements for power outputs up to 6,000 h.p. and be equally dependable as the single-screw machinery unit that will be fitted for propulsion. Separate arrangements will be provided for working the cargo in port to enable the usual cleaning operations being carried out systematically. The idea of using a single boiler for the steam requirements at sea enables the problem of coal burning to be reviewed from a new aspect, and favourably reopens the possibilities of pulverised fuel firing.

Mechanical problems involved in the pulveriser and furnace design have each been satisfactorily solved already and most of the difficulties that were experienced in attempts to apply this system of firing to cylindrical boilers are bye-passed, excepting the ash nuisance which was aggravated by the earlier conceptions that a principal merit of the new technique would be the ability to burn inferior fuels; this is fundamentally wrong since it involves the carriage of useless dead-weight. Coal can now be treated at the pithead, with little extra cost, to provide a uniform product containing less than 4 per cent. of the ash in the pure coal substance and free from all the gritty particles that proved so injurious to the experimental marine pulverising plants. This is a contribution to the problem which is the concern of the coal industry together with the question of more expeditious bunkering and mitigation of the associated dust nuisance.

It remains, of course, that the margins on cargo ship operation only allow a limited price to be paid for improvements having the object of increasing thermal efficiency and hitherto it has appeared that the adoption of improved steam machinery types involved a prohibitive increase of first cost. The motorship was costing 20 to 25 per cent. more than the steamship a few years ago, but this disparity has been almost entirely levelled out by manufacturing organisation, and similar principles of production should provide for equality of cost when it is considered that the adoption of such proposals will at considerably reduce the weight of materials involved in the construction.

This article has, in the main, been concerned with the directions which further improvement in marine steam propulsion may take. By way of contrast it is not out of place to refer to the outline specification for the triple-expansion steam engines of 2,500 i.h.p. in the ships built to British order in North America. It was included in the 11th Andrew Laing Lecture by Messrs. R. C. Thompson and Henry Hunter, and the authors' comment was that this type of machinery was looked upon in the United States as archaic. But in time of war, the necessity to obtain rapid production on a large scale and the avoidance of anything in the nature of a "technical adventure" are of paramount importance.

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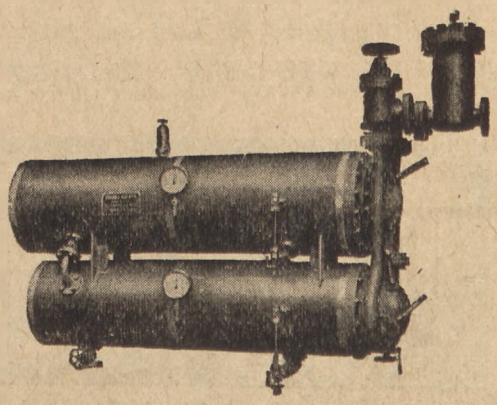

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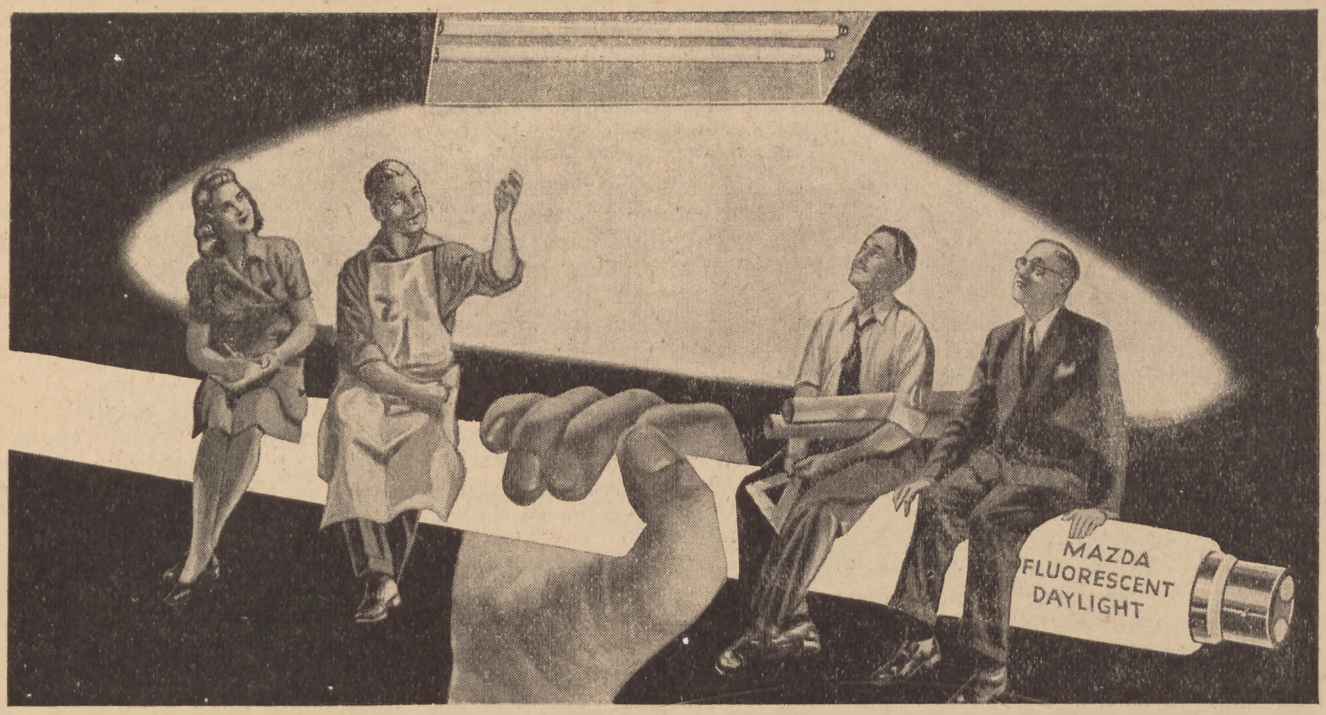

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MARINE APPLICATIONS OF ELECTRICITY

As with shipping and shipbuilding generally, so with marine electricity; scraps and pieces of information alone are available which give some indication of the trend of development and progress during 1942.

Three matters stand out as worthy of comment. First of all, the ordering by the U.S. Coastguard organisation of diesel-electric ice-breakers for use in Arctic waters; secondly, the launch of the French turbo-electric liner *Kairouan*; and thirdly, the increased use of alternating current, not only for propelling purposes, but also for auxiliaries. This applies to ships propelled by geared turbines and oil engines, as well as to full electrical vessels. Several new suggestions for rationalised layout of electric ships have been made, and finally it is interesting to recall that the year 1942, from the historical point of view, can be marked as the centenary of some of the early attempts at electric propulsion for ships.

Mention should also be made of several important technical papers, which have been read before distinguished societies, and in particular one discussing the application of storage batteries, a large portion of which was devoted to the marine side.

In times like the present, it is necessary to sense rather than possible to pronounce upon trends of developments. The past year has closed in this respect with the feeling that in post-war years electric propulsion will be considered more seriously than ever before. It will not be dealt with on previous lines where conventional layouts have been considered; on the contrary, designers will realise one of the principal aspects of electric drive, which they have for so long neglected in its fullest aspect, is the extreme space flexibility of generator vis-a-motor.

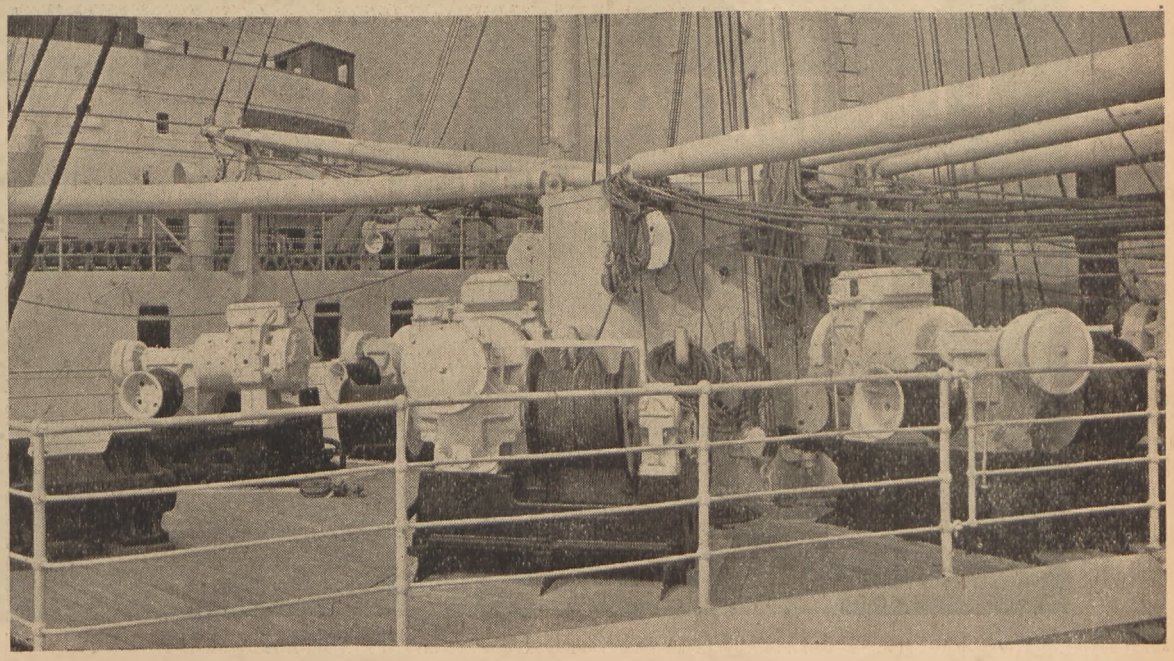
Experimenters with electricity, a hundred years ago, were attracted by the importance of its use for propulsion. So, briefly, we may recall that although many experiments were made in 1838 and 1839, on the Neva by M. Jacobi, about 18 months later a Mr. W. Petrie, of Croydon, took out a patent for a new mode of obtaining a motive power by "voltanic" electricity These, and similar early experiments, were summarised by a writer in the "United Service Magazine," Part I., 1843, under the title, "Naval Improvements of the 19th Century" in the following terms:

"What an annihilation of every difficulty is promised us by those philosophers who are bent on making steam succumb and give place to electro-magnetism as a motive power."

Even in those secure days it would appear steam had its rival, but, contrary to the expectation of this writer, the hundred years which have elapsed since he put pen to paper have not seen the elimination of steam by electricity, but rather a very happy combination of the two. This reached an important peak in the curve of development early in 1942 by the launch of the first ship put into the water by Vichy France, the *Kairouan*, a turbo-electric liner for the Marseilles-French North Africa service. The *Kairouan* is a ship which in peace-time would have been greeted by the technical world with an embarrassing degree of interest. Even so, what little information is available has been eagerly seized upon for comment.

As this review article was being written, the author was fortunate enough to receive some late advices as to the main features of the ship. It is generally agreed that her design and construction was inspired by the *Normandie* and by that ship's successful operation on trans-Atlantic service. Incidentally, it is worth recording here that last year the *Normandie*, renamed *Lafayette*, was burned in her New York pier, turned on her side, and is now in the long and difficult process of being salved.

The *Kairouan* was ordered in April, 1939, by the Cie. de Navigation Mixte, from the Chantiers de la Mediterranee. She was launched just 10 years after the *Normandie*, and displaced only 8,300 tons, some 80,000 tons less than that of the trans-Atlantic mammoth. The electrical power plant was made by the same manufacturers. Though the power is considerably less, only 24,000 s.h.p., as compared with 160,000 s.h.p. in the trans-Atlantic ship, contemporary improvement in steam generation is reflected, the output per boiler being some 6,000 s.h.p. as compared



Electric winches may be regarded as standard on board large passenger liners

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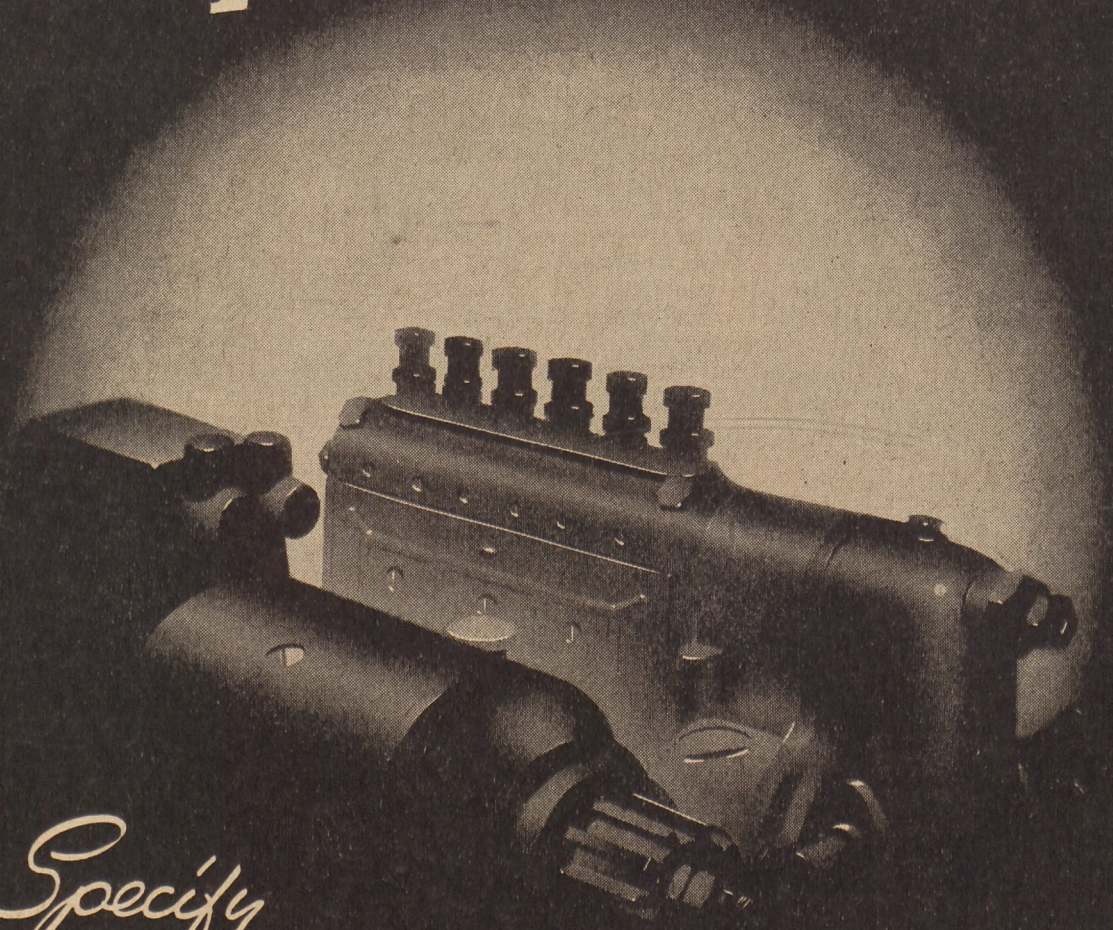

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with under 5,000 h.p. for the larger ship. Lamont "fuel-valve" boilers are employed in the newer ship, generating steam at 570 lbs. per sq. in., and 800 degs. Fahr., compared with 400 lbs. per sq. in. and 680 degs. Fahr. in the water-tube boilers in the larger and older ship.

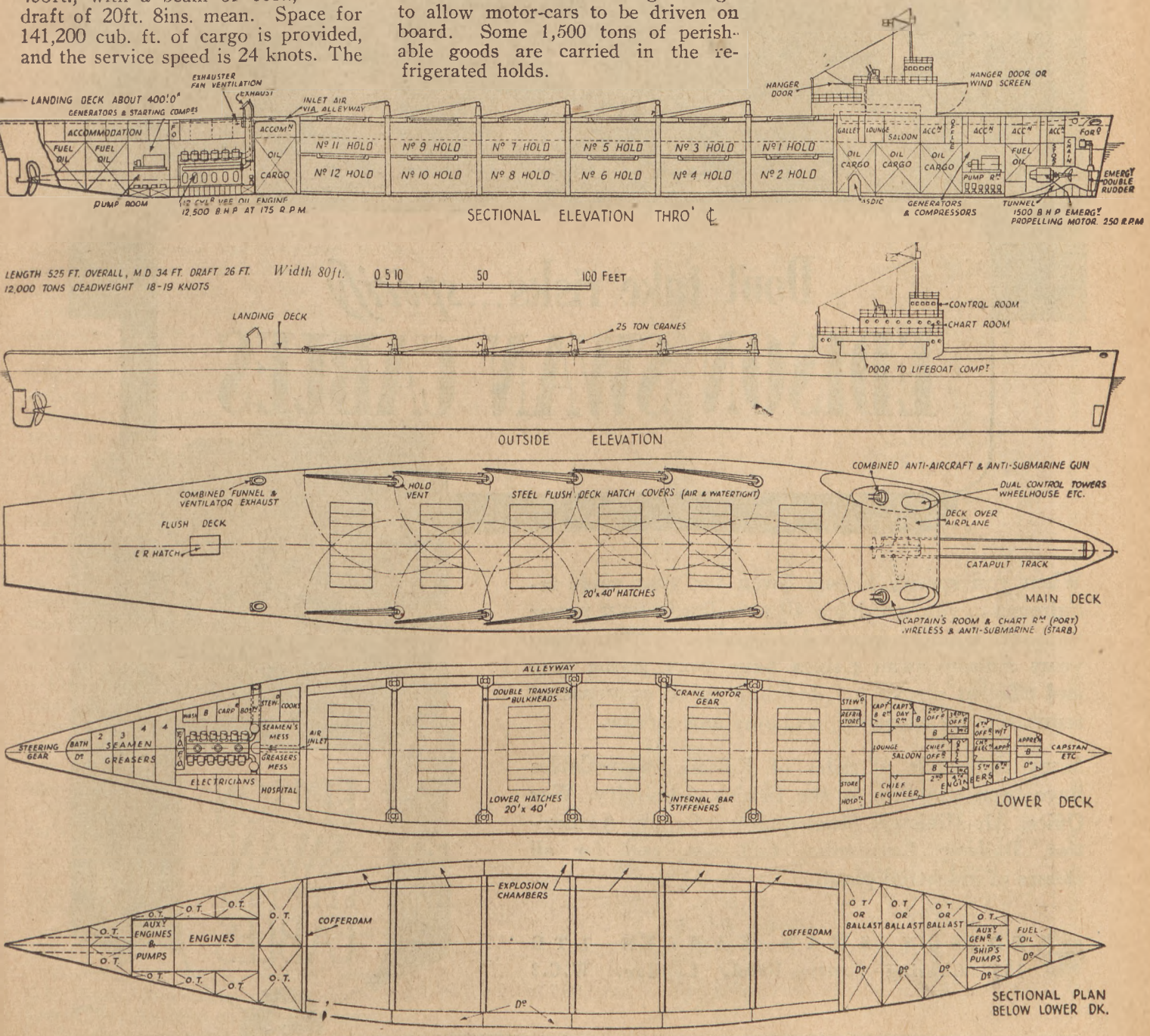
The turbine speed, too, of the *Kairouan* is higher, being 3,420, compared with 2,250. The propellers, however, two in number, turned much more slowly, 190 as against 225. Another vitally important point is the fact that auxiliaries throughout the ship are alternating current, 220v., as compared with the *Normandie's* 220v. d.c. The length of the *Kairouan* is 456ft., with a beam of 60ft., and a draft of 20ft. 8ins. mean. Space for 141,200 cub. ft. of cargo is provided, and the service speed is 24 knots. The two turbo-electric main generator sets have 9,020 kilowatts each, at 3,420 revolutions. The auxiliary plant comprises two 1,500 kilowatt turbo-generators, 220 volt a.c. and three 250 kilowatt diesel driven alternators.

Apart from the boiler plant, and certain details which follow, by far the most interesting aspect of the design of this ship is the auxiliary equipment. On deck, this comprises two cargo winches and two cranes; note the small equipment, for cargo can be loaded and unloaded through 12 side doors fitted in the hull. Cargoes of early vegetables in small baskets of uniform size can be loaded by revolving belts and escalators. One door on each side is large enough to allow motor-cars to be driven on board. Some 1,500 tons of perishable goods are carried in the refrigerated holds.

This ship is the first turbo-electrically driven vessel for operation between France and North Africa, and indicates that even in these difficult times the spirit of technical adventure is not dead in France.

Indeed, the development of alternating current for shipboard work, which by many people is considered inevitable, will have much for which to thank French engineers.

Another interesting ship, from the marine electricity point of view, as well as from the point of view just mentioned, was reported to have been launched towards the end of 1942. This was the 20½-knot French triple-screw passenger liner *Marechal Petain*



Mr. W. S. Burn's proposed design of cargo ship adapted to war conditions.

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also building in the Mediterranean for the Far Eastern service of the Messageries Maritimes. A triple-screw motorship, this vessel uses alternating current for all purposes throughout the ship. Four Sulzer engines drive 950 Kva. Westinghouse 220 volt 50-period three-phase alternators, the motors for the pumps, ventilators, capstans, refrigerating plant, and equipment being operated at this voltage.

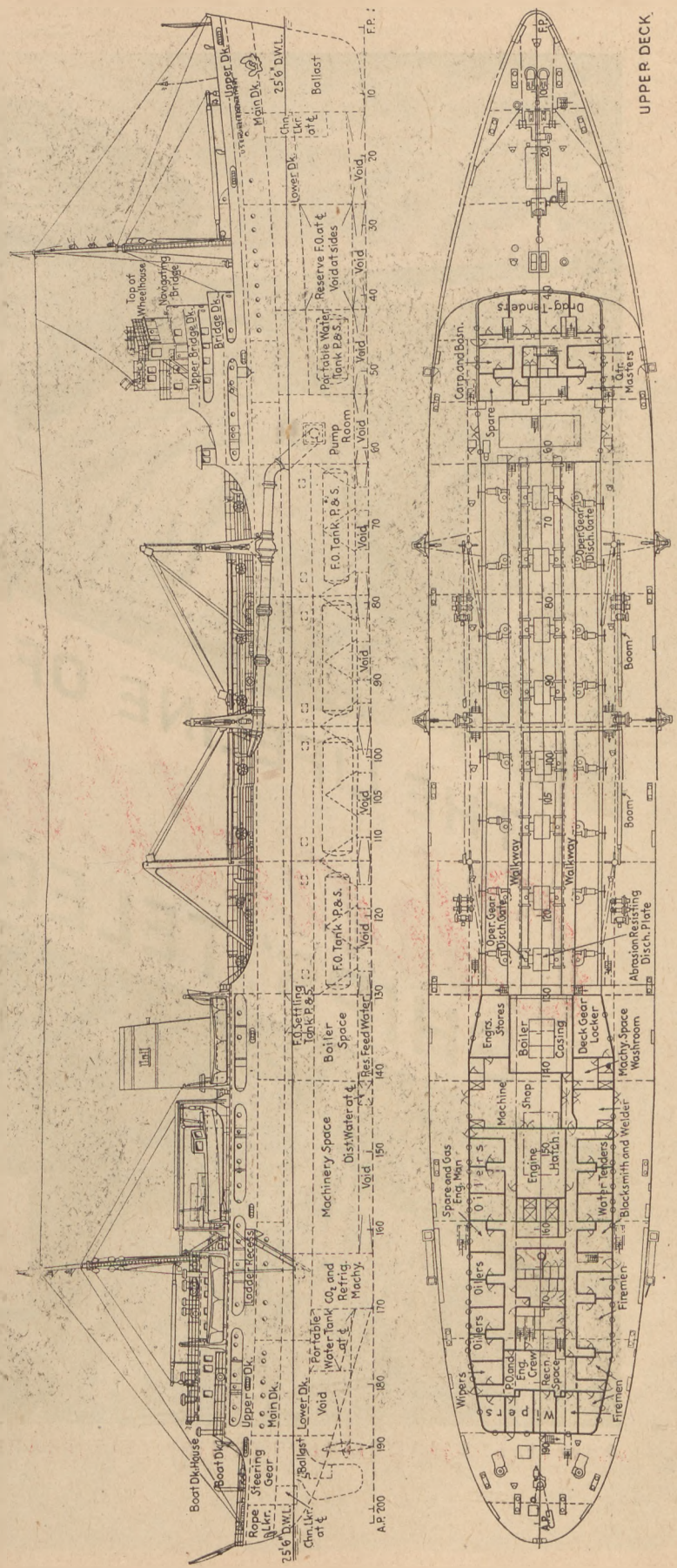
Another point in common between this triple-screw motorship and the twin-screw electric vessel is that exhaust gas boilers of the same make as the main steam generating plant of the *Kairouan* are fitted. This is instanced as one of the ways in which steam and diesel seem to be approaching in the higher types of power plant now building. It is true that in the electric ship the "fuel-valve" boilers have been employed for steam raising, while in the motorship they are exhaust gas boilers producing 150 tons of fresh water per 24 hours; they might equally, however, have been employed as in certain ships, to drive turbo-generators This rapprochement has been a feature in the last few years' development, and it is particularly to be noted in connection with 1942.

Now the use of alternating current for propelling purposes was pioneered in Germany with Swiss Brown Boveri machinery, and M.A.N. engines in the Hamburg-Amerika liner *Wuppertal* in 1936. She was employed on the Australian trade, where the schedule called for an outward speed of 13½ knots and return of 15 knots. As the outward run required only two-thirds of the power of the homeward voyage, one of the three generators was shut down for the whole period, this allowing overhaul to be carried out while the vessel was under way, an advantage which, of course, could be taken if d.c. equipment were employed.

The relative advantages in characteristics of a.c. and d.c. have been too often explored to need repetition here. What is to be emphasised, however, is the great hold which alternating current now has upon the propulsion of peace-time merchant ships. It has also spread to the U.S. Navy.

For this fighting force, a ship of particular interest to shipbuilders and shipowners as well as to machinery manufacturers, was launched in 1942. She is the first ship built in the United States to have a.c. electrical propulsion equipment in conjunction with diesel power, though a.c. current had been used with turbo-electric drive in six battleships, commencing with the U.S.S. *New Mexico* in 1918, after experiments with the naval collier *Jupiter*. Turbo-electric a.c. propulsion was also installed in the aircraft-carriers *Lexington* and *Saratoga*.

According to details officially issued a U.S. Navy ship launched last year, the *Sperry*, has electrical machinery constructed by Westinghouse, while her eight two-cycle oil engines were manufactured by the



Outboard profile and general arrangement of upper deck of projected seagoing hopper dredge (Hull No. 226) designed by the Corps of Engineers, U.S. Army.

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Cleveland Diesel Engine Division of General Motors Corporation and aggregate 12,800 b.h.p. Two separate water-tight machinery spaces are provided for the machinery. In each compartment there are four generators direct connected to oil engines of 1,600 b.h.p. each, one propulsion motor, one excitation motor generator set, and one control unit. The two propulsion systems can operate independently of each other.

The generators are rated at 1,150 kilowatts, 95 per cent. power factor, 2,400 volts, 750 r.p.m. three-phase 62.5 cycle. They have a closed self-ventilating system with surface type water coolers. Two generators in each compartment are used for propulsion anly, and are excited from a separate motor generator set. The other two generators in the same compartment are for propulsion and for parallel operation with the regular ship service generators during periods of excessive power demands. The propulsion motors are of synchronous type, rated 5,900 h.p. 2,400 volt, three-phase, 62½ cycles, 139 revolutions per minute. Each motor is directly connected to its respective propeller shaft.

Two fairly large transformers are used, in conjunction with the propulsion generators, which are arranged to supply additional power for ship's service. They are rated 1,000 Kva. 2,090/450 volts. The auxiliary load is high, because the variety of shop equipment, cranes, foundry, &c. In this case loads of 2,500 kilowatts are expected at certain times, and the total connected load will be approximately 6,000 kilowatts.

It will be recalled that the United States has also employed alternating current on the propulsive side in such interesting types as lighthouse tenders and a new type of Tuna clipper using three motors on a single shaft geared to the propeller. The fact that similar developments have not taken place in this country is certainly no reflection on British marine electricians. Indeed, it is well known that some little time before the war, at least one important electrical concern in this country had designs prepared for diesel-electric alternating current propulsion of the largest of passenger ships. Had the war not intervened, it is more than likely that an order for such equipment would have been placed.

Meantime, British marine electrical firms, in so far as time permits, are thinking of the future, and will be completely prepared for any demands which shipowning and shipbuilding may make upon them. In this connection it is interesting to recall that one company has produced the first reversible magnetic coupling, electromagnetic slip couplings having hitherto been concerned with equipment requiring the engine itself to be reversed. This development is a parallel to that carried out in the early days of the hydraulic coupling, when both an ahead and an astern coupling was fitted. The disadvantage of this would not, however, apply to the electrical gear as it concerned heavy weight and large space taken up. This, however, is by the way, for it is very difficult to say anything of developments in this country.

To return, therefore, to the United States, and to details of the diesel-electric icebreakers mentioned above, these concern normal d.c. types of operation. Each is to cost nearly $7,000,000, and will be 250ft. long with a beam of 60ft. and a displacement of 5,000 tons on 28ft. draft. Diesel-electric machinery of 10,000 h.p. is to cost $1,800,000 for each ship. There will be the usual two propellers aft, and one forward. It is stated in an official announcement that a large cruising radius will be a feature and that each ship will carry an aeroplane.

For the first time, it would appear, America is entering the field of large-scale icebreaker operation. In the

Constant vigilance, typical of the Merchant Navies of the United Nations, is suggested by this study of a Norwegian ship's officer on watch.

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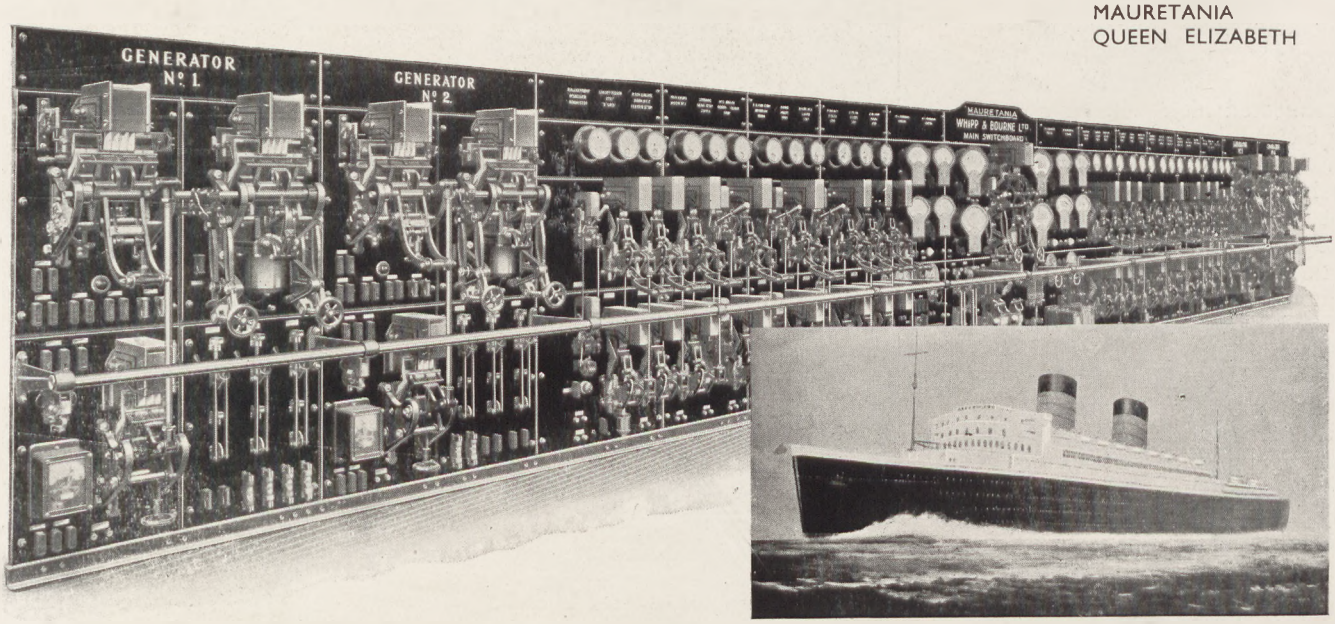

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past she has been content with relatively modest sized vessels of large tug type; some of these have been built and operated on the Great Lakes.

It is interesting in this connection to recall that an interesting paper was presented in 1942 to an American technical society, under the title "Manoeuvring a Coastguard Harbour Cutter," the propulsion of which was of diesel-electric type, employing variable speed engines, and variable voltage, direct current electrical machinery. The two main diesel generating sets furnish propulsion and auxiliary power, the engines being of eight-cylinder, two-cycle type, rated 640 b.h.p. at 750 r.p.m. driving 400 kilowatt 250 volt. separately excited d.c. generators. The propulsion motors comprising a single unit 500 volt. d.c. type rated at 800 h.p. 250 r.p.m. for normal purposes and 1,000 h.p. 235 r.p.m. for icebreaking duty. The motor is direct-coupled to the drive shaft on a single propeller.

The test records of actual propeller torque during manoeuvring of this ship are an important contribution to technical literature. It may well be hoped that similar information will be available in post-war years concerning the operation of the large diesel-electric icebreakers referred to. With the exception of one such ship in Sweden, the *Ymer*, built some years before the war, and some unknown vessels in Russia, icebreaker ships have been mainly steam driven.

When, too, details come to be published, it will be of interest to note whether any advantage is taken of flexibility of layout, to which reference has been made above. The use of horizontal vis-a-vis engines in an icebreaker, where much headroom may not be available, might well be considered. The entire separation of the motor-room from the power generating room is another point worthy of note.

The latest technique in the diesel-electric propulsion of merchant ships, however, suggests that the power-room will be above the motor-room, and that both will be confined to the minimum space aft. A particular suggestion from Germany proposes a horizontal vis-a-vis supercharged two-cycle engine. It is to be noted, however, that there is nothing new in this arrangement, since it was pioneered by a British concern in the early 1930's. operating successfully in the world.

With so much tanker tonnage now with machinery completely aft, there is no reason why the generator-above-motor layout should not be considered.

Examination of layout for a proposed 9,000-ton 13½-knot electric ship, with opposed piston supercharged engines, and exhaust turbine, shows a single generator equipment with two diesel-electric auxiliaries arranged in the 'tween decks aft underneath the poop, where normally the crew would be housed. The single propelling motor is immediately below this, in a compartment immediately abaft the aft peak. There is very little tank-top space where the motor is, but it is a single armature unit, presumably fairly accessible, and the shafting has only slight rake.

A proposed 9,000-ton 16-knot electric ship has twin screws with 8,000 s.h.p. In this layout there are two generators of the kind mentioned, in an upper 'tween deck, the top of the engine necessitating in this instance a fairly large poop house. Here, too, there is a single propeller motor, but this appears to be slightly further forward than in the lower powered ships. The auxiliary generators are situated in a compartment below the main generators. This certainly is marine electricity presented in a new and interesting light. The layout

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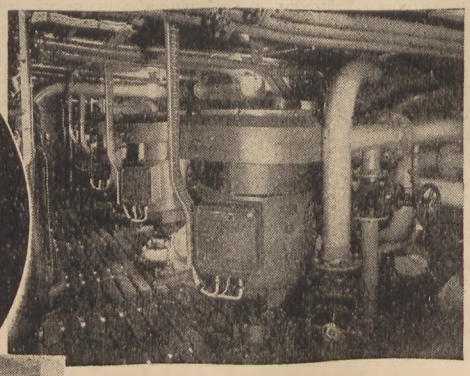
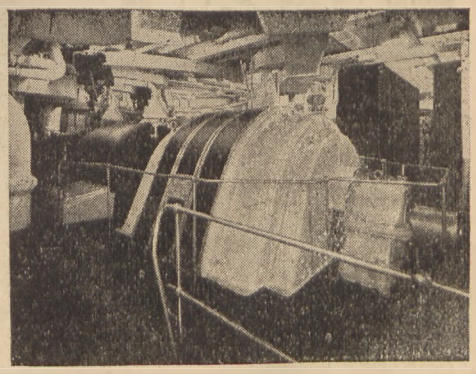


18 h.p. totally enclosed brine pump motors in the brine room of a Blue Star Ship.



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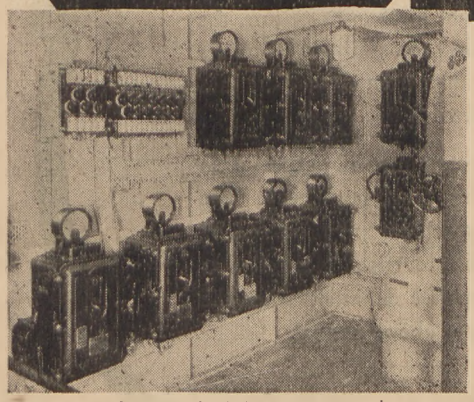

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would seem to be acceptable, provided that the total weight would be no greater than that of a direct coupled steam or steam plant at the aft end of the ship. But the centre of gravity of the whole of the electrical machinery is certainly further aft than with a normal equipment, and it may therefore need some adjustment of design in the way of contemplating trim tanks forward.

Effect on stability of the weight high up in the ship should be negligible. Overhaul should be fairly easy, and the design shows that the propelling motor space in each case has fairly large hatches immediately overhead both on the main deck and in the 'tween deck space. This leaves the "best and fattest" part of the ship amidships available for cargo-carrying. It suggests, moreover, if pilot house control is to be employed, a resuscitation of the arrangement first made by Mr. Lester M. Goldsmith, in the tankers of Bessemer class, in the late 1920's, whereby navigating bridge and all living quarters were aft in a special superstructure, thus leaving the whole of the deck from forward of the poop to the bow completely clear.

Such an arrangement would appear to have advantages in any electric ship which might be designed specially for the carriage of bulk cargo. It would, however, on account of the exposed nature of the deck, require very careful consideration as regards hatch cover design Steel covers would probably be necessary and would call for special deck arrangements in the way of winches and derricks to handle the covers. Or it is too much to suppose that electric cranes stowed flush with the deck when the ship was at sea, would perform these duties?

This perhaps is thinking very much ahead, but it is not unreasonable when the strides now being made in electric propulsion are taken into consideration. So these suggestions made in 1942, while they can justifiably claim British origin, are of extreme significance.

All this concerns diesel-electric drive, but we have seen that the future for turbo-electric drive is by no means dark, particularly if ships of the *Kairouan* class continue to be produced. One factor pointing a finger in the direction of increased diesel-electric drive is the likelihood of high-speed light weight engines. Only a few years before the war, engines weighing up to 350 lbs. per h.p. were constructed, but at the present time this weight can be reduced to between 17 and 20 lbs. In this direction diesel-electric propulsion shows itself to great advantage.

Mention has been made of storage batteries. Whatever developments may have taken place in their marine application during 1942 presumably remain secret, but it is important to note that Mr. E. C. McKinnon, a member of a well known firm of storage battery manufacturers, contributed to the Institution of Electrical Engineers some time ago a paper reviewing the application of storage batteries. Interest was revived in this subject during 1942, and the author recalled some facts in connection with a then new diesel-electric ferry, mentioning that in this scheme for a diesel-electric "floating bridge," storage battery played an all-important part, 60 traction type cells having a rated capacity of 226 amp. hours in 5 hours, being connected directly across the main generator terminals, so that they discharged to assist the generator while the ferry was actually being propelled, and for the rest of the time took a compensating charge current from the specially designed generator.

The use of storage batteries on board ship was a sub-technique, it may

(*Continued on page* 283)

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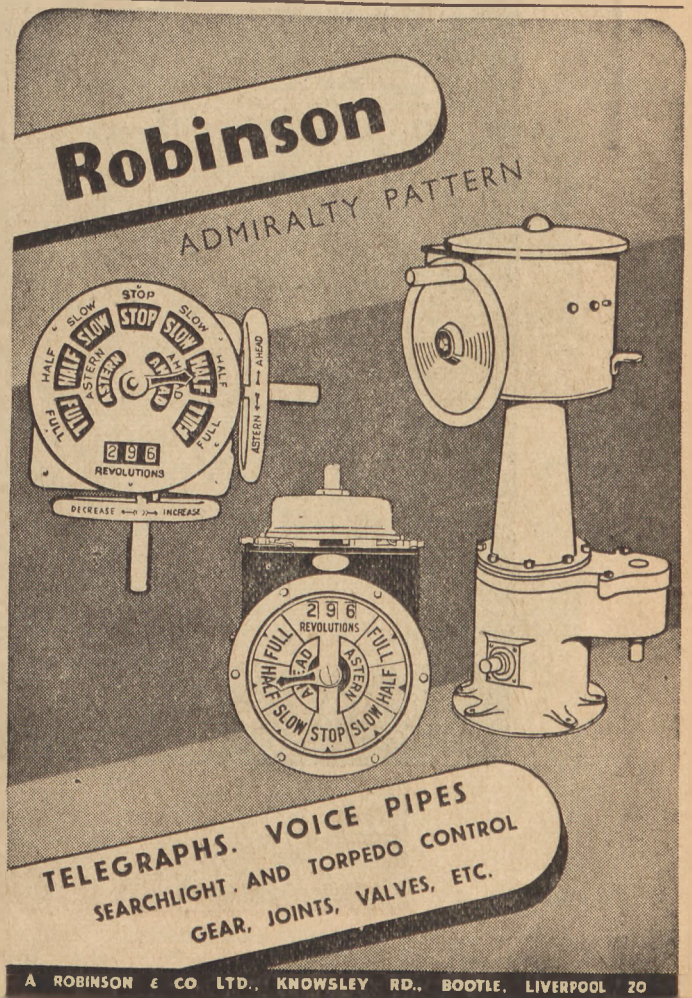

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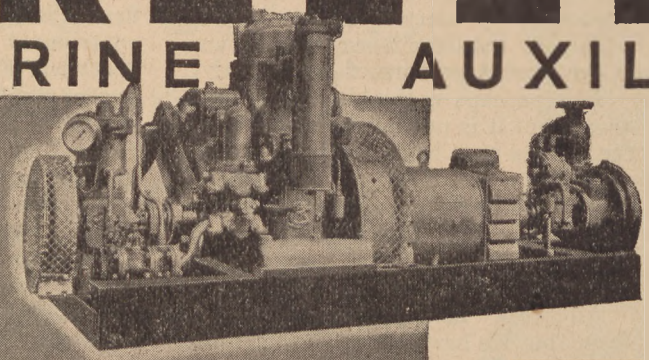

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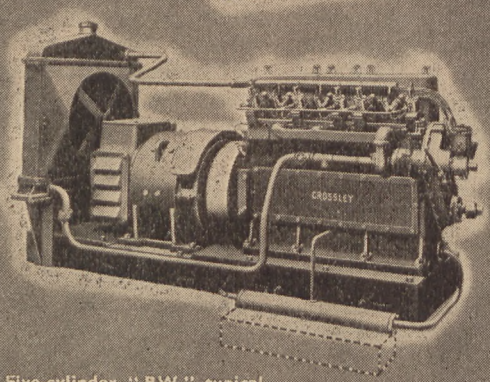
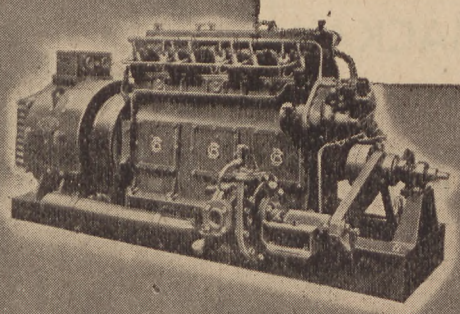
Vertical scavenge-pump Diesels for propulsion are built in three to eight cylinder sizes—direct reversing — 75 b.h.p. to 500 b.h.p.

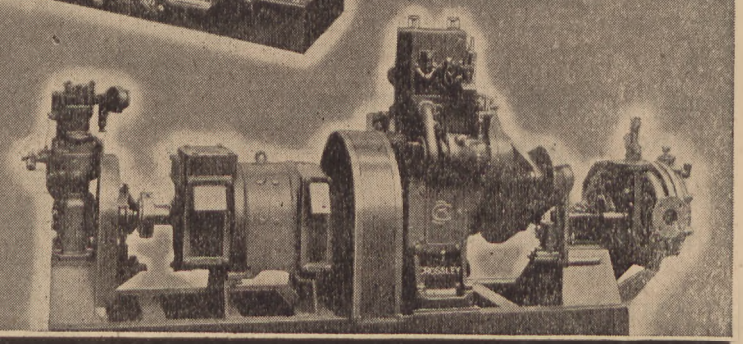
Similar types for auxiliary use are built in sizes from 60 b.h.p. to 165 b.h.p., and 4-cycle Diesels from 6 b.h.p. to 3000 b.h.p.



Five-cylinder "BW" typical marine auxiliary emergency generating set of 46 k.w.—220 volts, for deck mounting, — arranged to operate even when inclined in any plane at an angle of 25 degrees to the vertical.



Six-cylinder "BW" type engine coupled to generator of 45 k.w. 110 volts, and chain-driven water pump. Note the compact arrangement of compressed air starting receiver.



Single-cylinder "BW" type auxiliary set direct coupled to 3 k.w. 110 volts generator, centrifugal pump of 10 tons per hour output — 36 feet head, and air compressor of 7½ cu. feet of free air per minute capacity — working pressure 350 lbs. per sq. inch.

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Trends in Machinery Space

By A. C. HARDY, B.Sc., A.M.Inst.N.A.

IT is difficult to write about material progress in motorshipping during the year 1942. That it is not entirely absent is proved by occasional glimpses obtainable through the fog of war and the curtain of security. The completion of a gas-engined ship in Denmark, the first of her kind, is an example; news of a pressure-charged engine-room is another and an important one, for it is in developments inside and around the machinery space that the future of motorshipping with its many ramifications is being determined. If this article does no more than discuss trends in machinery space it will mirror contemporary thought for future reference.

Let us deal first with general trend, then with possible, probable and desirable layout, and finally with actual achievement in these directions as far as information permits. As regards the first, the tendency towards compression of machinery which was showing itself before the war is being maintained. It has for its ultimate target the modification of net tonnage measurement which admittedly at the moment is a complete anomaly in that the rule penalises the small machinery space and puts, therefore, a premium on the smallest and, power for power, often the most modern type of machinery.

The present system of measurement, too, has for similar reasons hindered designers who have visualised carrying 'tween decks all fore and aft low down in a ship. The extra space so gained in meat and fruit carrying ships might amount, conservatively, to as much as 5 per cent. of the total capacity. This in itself is an important post-war consideration when quality rather than quantity of tonnage will be called for, and highly specialised tonnage at that.

Arguments against the totally enclosed machinery space are as standard as they are well known. The bogey of lack of reliability of the oil engine still stalks abroad; his footsteps are likely to be heard more vigorously when the high-speed geared engine is considered, but the totally enclosed engine-room does not mean that access to machinery parts is denied; bolted plates can secure access and egress, and the trunk ventilation which designers of the future may or may not decide to be necessary can be adjusted as emergency lift shafts. It is possible, too, that if high-speed units are employed their number will be such that the individual unit is compact and light enough to lift out as one unit. The way to the totally closed engine-room has already been pointed out, as mentioned.

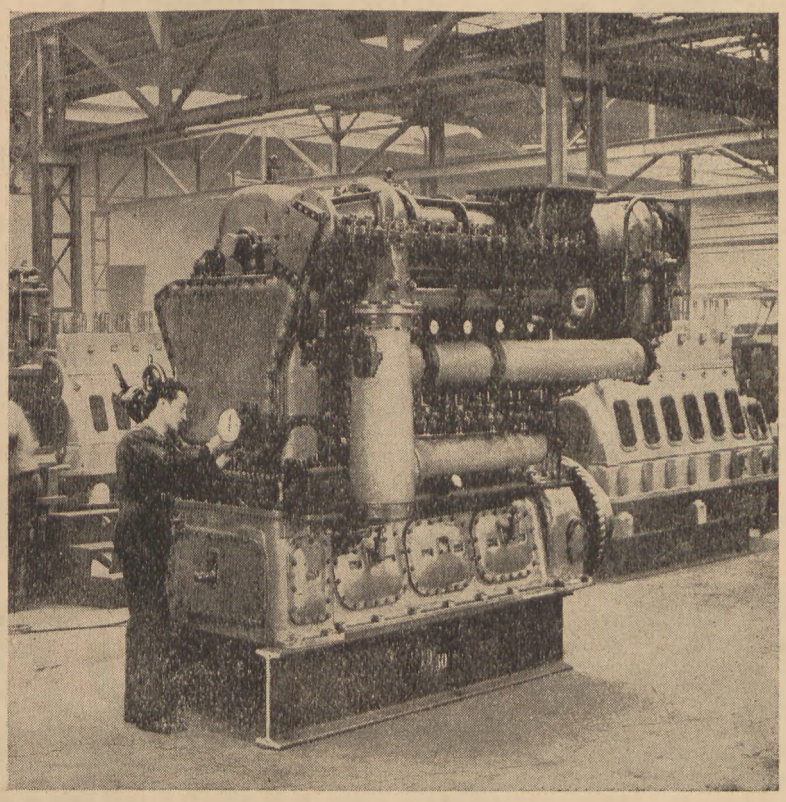
It is true that the space advantages of the compactness of modern machinery have never been employed, for reasons stated, in cargo carriers with machinery amidships, even when that machinery was conventional. Indeed, the size, shape, and design of engine-room openings has remained static for about half-a-century—because of net tonnage measurement and because

(*Continued from page* 281)

be called, of marine electricity which was going ahead with considerable vigour prior to the outbreak of war. Emergency lighting circuits, and even certain pumps were selected for the employment of batteries. Developments were also taking place for the use of storage batteries on trickle charge as standby in the event of the failure of current which would automatically cut out an electric or electric-hydraulic steering gear. Some years before the war a case occurred in which, due to water getting in the diesel oil of the generators in a steam turbine-driven ship with diesel auxiliaries, the electric current shut down, the batteries took over, and the ship was able to steer her way into port.

In spite of these important developments, most ambitious battery equipment has been fitted in American ships. Mr. Louis R. Ford drew attention to this in great detail, in a chapter in his marine diesel handbook dealing with electricity on board motorships. Incidentally the appearance of this book may be considered as one of the points worthy of mention in the marine electrical year 1942.

To sum up briefly, then, although there is not much of concrete progress to report in 1942, the few glimpses one has been able to give indicate that the science and practice of marine electricity is by no means dead. Forward looking engineers are now contemplating with interest further information on the new ships mentioned.



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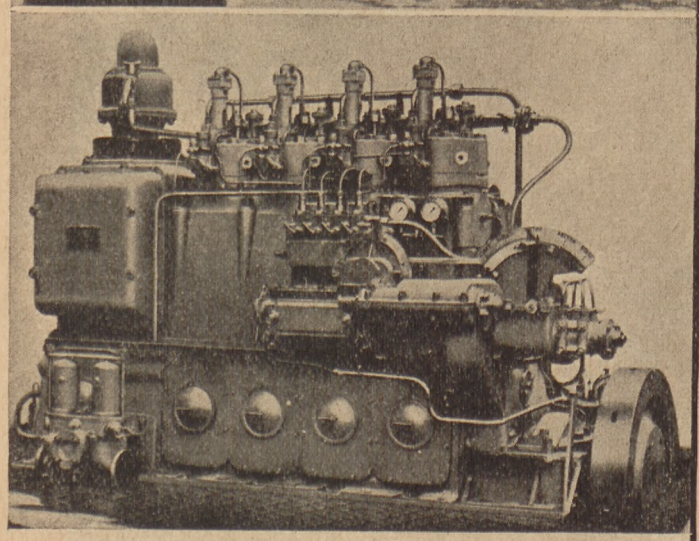

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of ventilation. Even with pre-1939 machinery, although steam presented certain difficulties, oil engine propulsion offered no problem. Passenger liner designers have tackled the question in rather a different manner, hence the spate of triple-screw passenger ship designs in pre-war years and the competition of geared diesel plans and the diesel-electric arrangements of the pre-war German cruising (" Strength Though Joy ") ships.

These ships were based upon some of the earlier geared diesel equipment fitted in the Monte class of emigrant liners built in the middle and late 'twenties for the Hamburg - Sud Amerika Line. This group of ships was among the first in the world with oil engines to be designed solely for the emigrant trade, as all third-class ships. The design was remarkable for the big clear public rooms on the top deck, and for the large number of multi-berth cabins carried as low down in the ship as possible.

This was only feasible by the use of four engines geared in pairs to two shafts, the engines themselves being of single-acting, four-cycle, air injection, trunk piston type. Even here, full advantage was not taken of the low engine - room height, because obviously, constructed as they were, to international tonnage measurements in those days, the rule had to be respected.

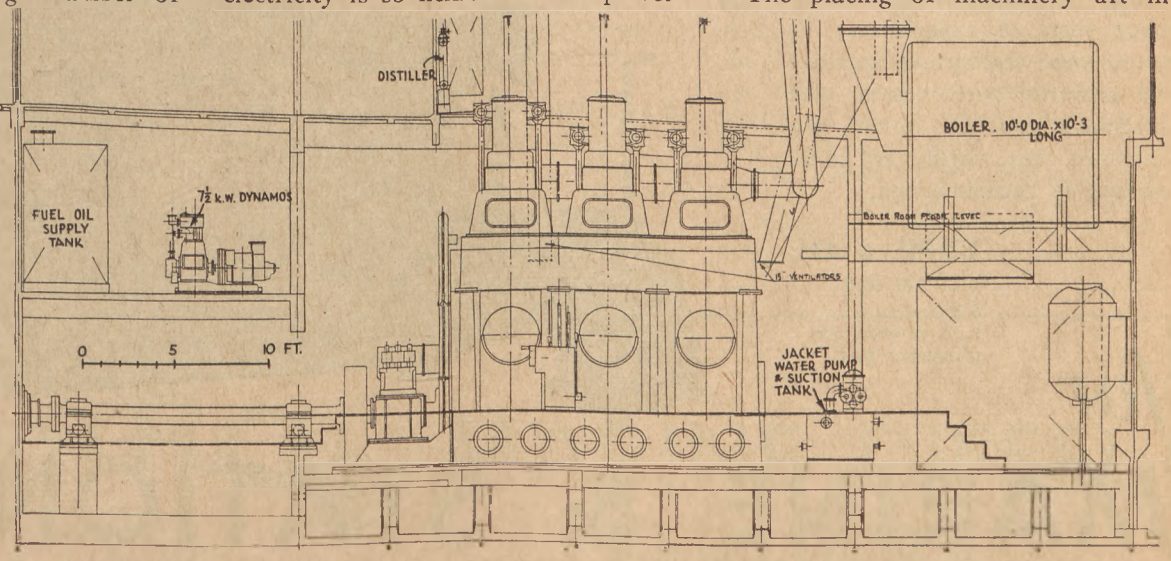
The cruising ship offered a plain indication of the lack of definite pre-war feeling as to the best way of obtaining maximum power in minimum space. One ship was fitted with geared oil engines, whilst the other had electric drive. In space taken up, there was little to choose between the two methods. If an absolute minimum of machinery space for maximum power available is to be the first aim of the designer of the future, then it would rather appear that for certain ships diesel - electric drive will reach a position of considerable importance.

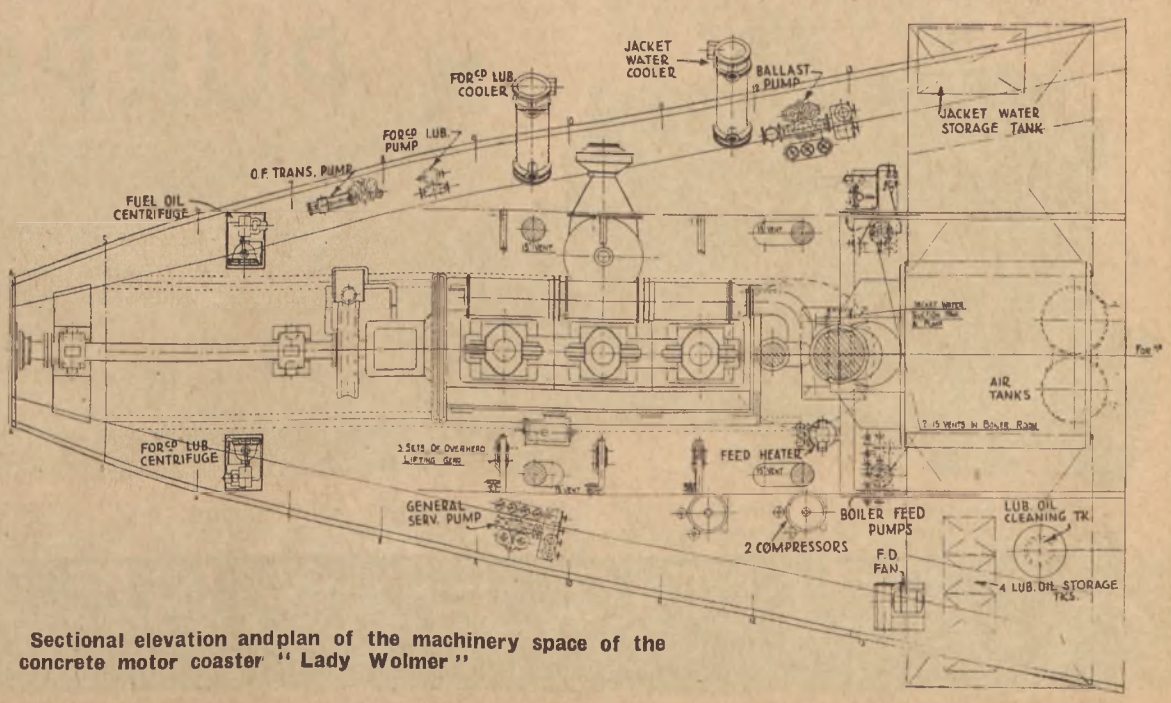
One of the great advantages of diesel-electricity has been its flexibility of layout. This has never been exploited to the full, except in a very few ships, so that, if it were desired to have a central propelling room, amidships, all closed in at the ends, and with but small access at the top, then it would be reasonable to place the propelling motor or motors aft, and thus secure a real and not theoretical space advantage in the elimination of the shaft tunnel or tunnels. It is a generalisation, but a real one, to say that no ship had yet been constructed in which full advantage of the elimination of the shaft tunnel has taken place.

Then there is another school of thought which says if diesel-electric drive is to be employed, then surely all the machinery should be aft, since electricity is so flexible. The power generator should be above the power user, the former being in a 'tween deck, at the aft end of the ship, and the latter somewhere near or abaft the aft peak. There is nothing new in this arrangement on paper, for Messrs. Crossley Premier, makers of the horizontal vis-a-vis four-cycle unit, prepared an actual layout for a ship of this kind about 10 years ago. The scheme has now been revived from another source.

At the time the original scheme was produced, shipbuilding was about to enter on that phase of depression from which it was only just emerging when war broke out. Consequently it was difficult for shipbuilders to persuade shipowners to build even the cheapest and simplest of vessels, without going in for anything which at that time, undoubtedly, would have suggested " fancy waistcoats " to the majority.

The placing of machinery aft in





Sectional elevation and plan of the machinery space of the concrete motor coaster " Lady Wolmer "

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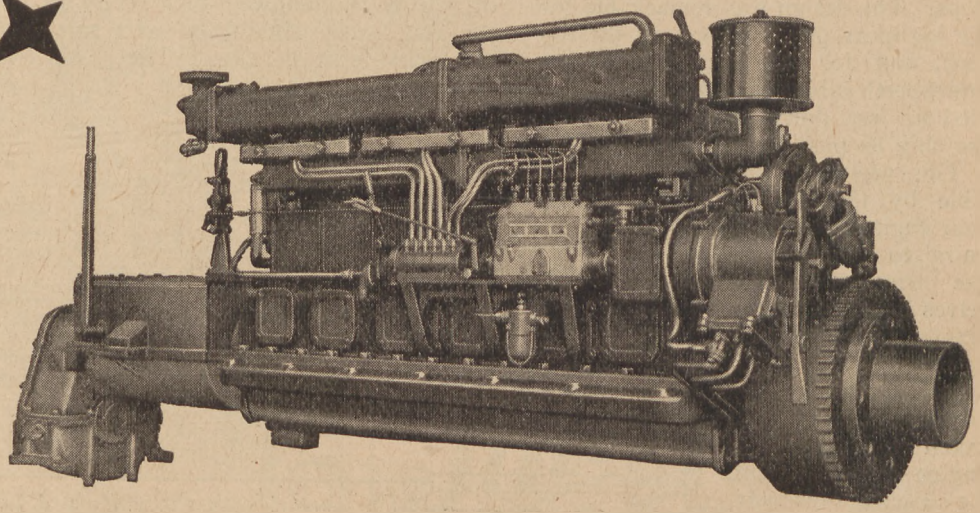

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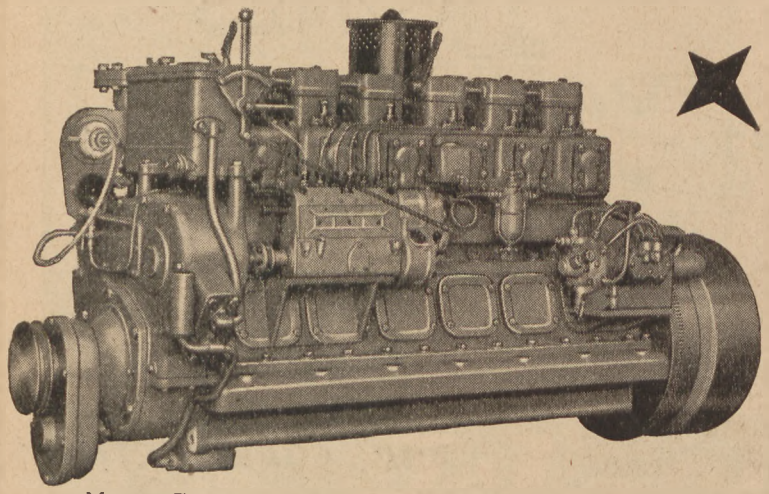

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ordinary cargo-carrying vessels is something which does not seem to have received the attention which it merits. Here, too, of course, under existing circumstances, the net tonnage measurement rule applies. Also, for ships of medium size, if the high powers likely to be required for the ship of to-morrow are too far aft, there may be difficulty in accommodating them in the triangular space available.

It is to be remembered, too, that modern machinery does not merely comprise the main prime mover. If this were all, the task would be simple, and in many tankers, by allowing the supercharged four-cycle main engines to drive nearly all its own auxiliaries, the problem has been overcome. But a 10,000-ton tanker designed to carry crude oil has but limited auxiliary requirements, her principal auxiliary being a Scotch boiler or boilers, which can in any case be arranged high up in the superstructure.

Not so, for example, the fruitship. That is why the *Francine*, built at Odense in 1936, and later sold to Copenhagen owners and renamed *Egyptian Reefer*, was such an important vessel. With a deadweight of 3,235 tons and a length between perpendiculars of 345.6ft., she had at the extreme aft end of the hull a 10-cylinder, 19.69ins. x 35.43ins. single-acting, two-cycle, airless injection engine, developing 3,400 b.h.p. at 160 revolutions, power which gave her some 16 knots on a mean draft of 21ft. 3ins.

The *Francine* was admittedly an experiment. Whether she was successful or not has remained a secret. If success is measured by repetition, the answer would be no. The price paid for having the best part of the ship amidships free for fruit accommodation, may have been too dear in terms of trim and complication of operation. As against this, it may be argued that the *Francine* was but little larger than at least one ship with machinery aft, built shortly before the outbreak of war, to operate regularly across the Pacific. This ship bore a name which has since become historic, *Tulagi*, and had a length between perpendiculars of 240ft. with a deadweight tonnage of some 2,250 tons and twin-screw propulsion.

She was somewhat similar in size to the *Ocean Coast* class of cargo liner, built for Coast Lines Ltd. before the war. Here, on a deadweight of 1,790 tons, twin-screws for 12 knots were arranged at the aft end of the ship. There is no doubt that for medium-sized vessels there was a distinct design tendency to place the machinery aft before the war, and all this within the framework of existing tonnage, light, air and space measurements. After all, machinery aft has long been accepted for tankers of up to 15,000 tons deadweight, and for whale oil factories to an even greater size.

This trend, then, towards compactness of machinery space is showing itself in two distinct ways. In ships in which it is desirable that machinery should be amidships, and this undoubtedly applies to powers of say 10,000 h.p. and upwards, decks are being carried as low down as possible, and as complete as possible, within the limits of existing rules. Designers are beginning to look around towards the possibilities of electric propulsion in this connection, with a small power room amidships and the propelling motors aft. The generators would be driven, no doubt, by high speed, double-acting, two-cycle engines, and by high speed we mean 800-1,000 r.p.m., no impossibility if aircraft practice is to be followed.

The alternative is geared equipment. A recent proposal for a machinery installation of 21,000 s.h.p. is illustrated. It is stated that, owing to the

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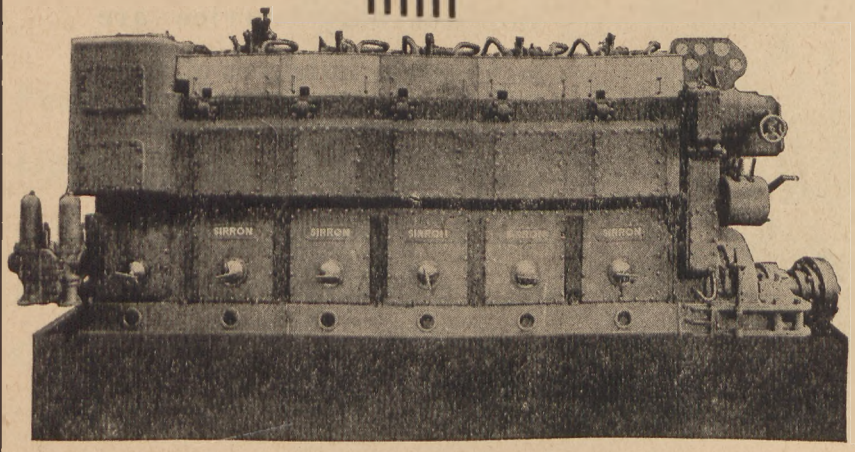

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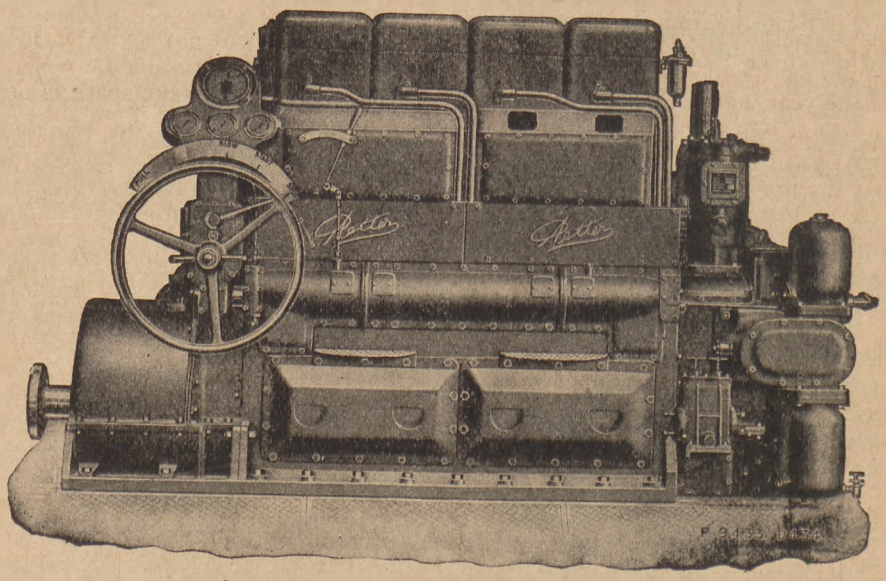

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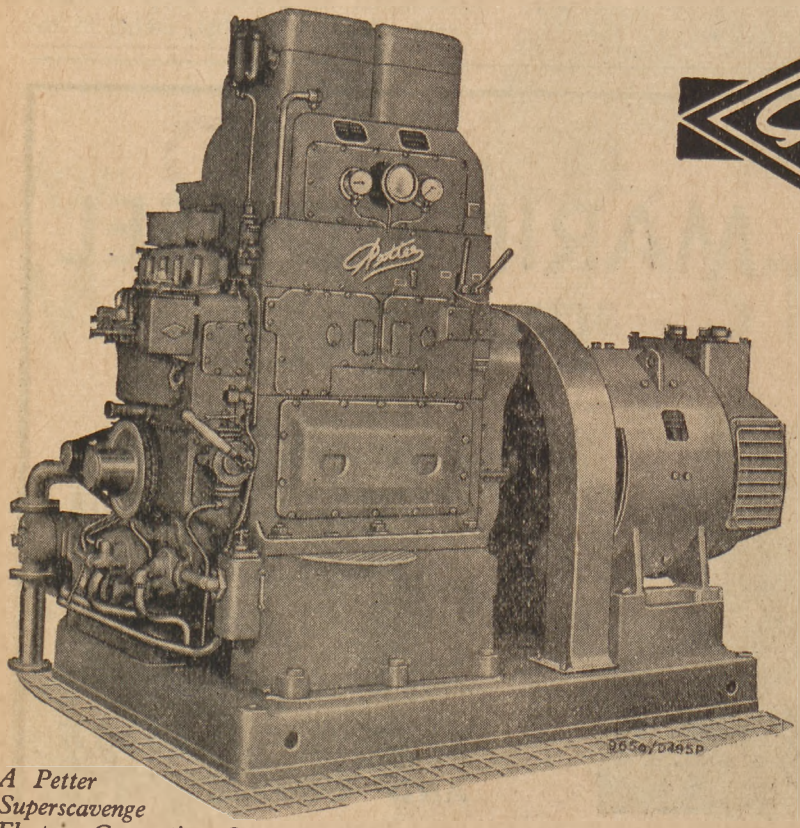

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nature of service, this ship should be capable of running economically at 20 knots and at 8 knots. Low engine height is essential in order not to interfere with the passenger decks, and a very small funnel is specified. The triple screw arrangement is borrowed from previous practice, but whereas all triple screw ships hitherto, up to and including the *Marechal Petain* which, if launched in 1942, was undoubtedly the outstanding motorship of the year, had single-acting two-cycle airless injection engines each coupled direct to the screw, this projected ship has an important geared layout.

A group of 12 engines was considered for the Swedish-American liner *Stockholm* when she was first designed, but was turned down by the owners on account of lack of sufficient experience with this type of machinery at the time.

In the present example, three groups of four engine, trunk-piston units, each 1,750 b.h.p., are proposed, the engine speed being somewhat surprisingly only 220 r.p.m., while the propellers turn at 120. This particular equipment suggests the use of hydraulic and not electro-magnetic couplings, and the engines are arranged in two engine-rooms, No. 1 containing the two wing groups, and No. 2 the centre group. No. 2 engine-room is flanked by large fuel oil tanks, thus conferring a very big radius of operation. There are four auxiliary generators, each 400 kilowatts at 320 revolutions, two in No. 1 engine-room and two in the aft engine-room. The two forward generators are side by side, whilst the two aft are separated by the after pair of the four main engines attached to the centre shaft coming between them.

Economy in uptake space is possible by the fact that the uptakes are divided. In the fore and aft length of the ship they occupy only 10 frame spaces, while thwartships the total width is half that of a pair of engines and gears.

It will be noticed that in referring previously to the all-enclosed engine-room the possibility has been suggested of complete covering in. This has not neglected the question of uptake for it is considered that in this advanced type of machinery space the vertical uptake may no longer be necessary, but that horizontal silencers combined with small pipe exhausts, running up through the small trunkways already allowed for, will be sufficient. This is a possibility, especially in the pressupercharged, air-conditioned engine-room of to-morrow.

So it is worth turning aside for the moment just to examine something in connection with the Harland and Wolff super - atmospheric airlock engine-room. It is interesting to note that the patent under which this arrangement has been made is in the joint names of Mr. C. C. Pounder, whose work in connection with modern motorship development is so well known, and Sir Frederick Rebbeck. Because of airlocks, the machinery space is maintained in an airtight condition, and fans supply the machinery throughout. It is therefore possible, in some cases, to dispense with the scavenge air-blower, an important matter where high-powered two-cycle machinery is concerned, because it "kills" a parasite auxiliary, while another advantage is that the pressure acting on the external surfaces of the crank chamber prevents any seepage of lubricating oil at the joints.

The patent specification makes mention of the fact that the air pressure maintained in steamers' boiler-rooms is commonly up to 10 or 11ins. of water. This is less than 0.5 lb. per sq. in., but it is proposed to keep the engine-room in the new layout at 3-4 lb. per sq. in., which apparently is within the limit of what is known to be the most convenient pressure in

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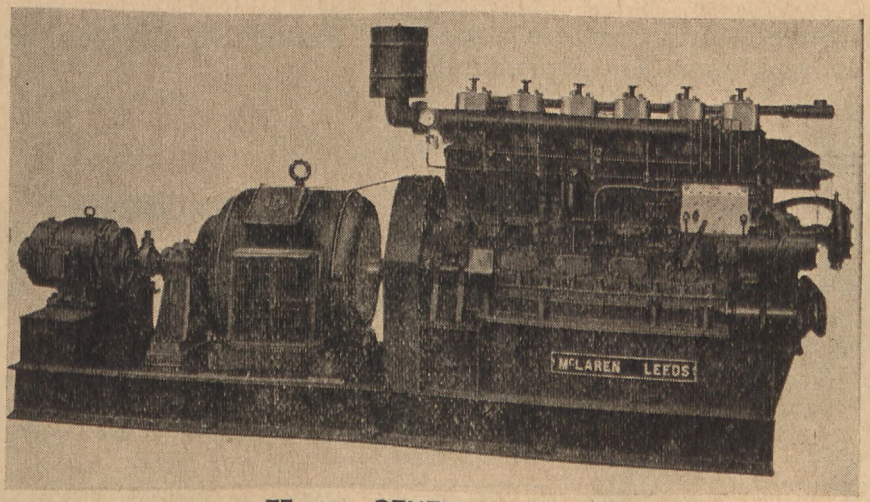

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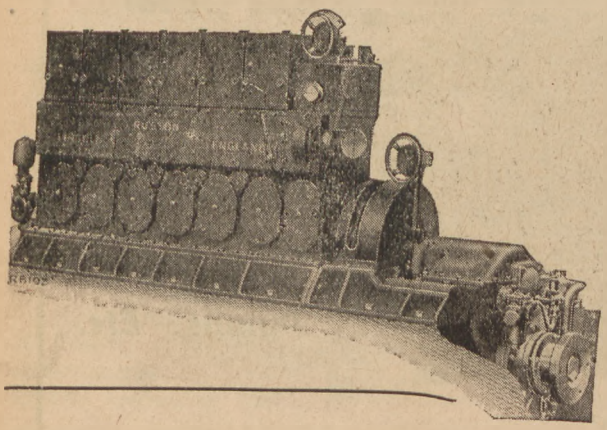

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which an engine-room staff can work without discomfort.

The great advantage is that instead of increasing the power of the machinery by fitting exhaust turbo-blowers, mechanically-driven blowers, or using the under-side of pistons and supercharging air pumps in four-cycle engines, the arrangement offers an alternative method of obtaining such extra power. As it eliminates certain auxiliary machineries, it, too, conforms to the ideal which has already been mentioned above, of putting more power in less space.

Though the patent specifically applies to big direct-coupled machinery, there is no reason why it should not be equally applicable to small high-speed geared equipment. The engine-room is totally enclosed, air under pressure being drawn in by fans, and thus into the engines as required. Here, again, the patent is taken out with existing tonnage measurement rules in mind. Doubtless vast improvements could be made were the 13 per cent. regulation scrapped.

General trend, therefore, is all towards the shrinking of machinery space. There are many possible layouts. If the 13 per cent. rule were altered, there is no reason to suppose that it would hasten the demise of the tall, direct-coupled unit, though how much a modification of the rule would give increased benefit would naturally depend upon the space required for overhaul. The bigger the engine, generally speaking, the larger the overhaul space necessary, the ideal, as suggested above, being the elimination not of a part of an engine, but of a part of a complete power plant which in itself is an individual unit.

Much development work remains to be done before this will become possible. It will never be universal. Then, too, the question remains to be answered, if engine-rooms are to become lower and lower, will there not be a tendency for the horizontal engine to come into its own again? It will be remembered that some of the earliest propelling engines of motorships were horizontal units. Even some of the earliest submarine engines were horizontal petrol units. One of the most successful petrol units ever built for small work has always been a horizontal engine. But to-day there is only one motorship afloat in which this type of prime mover is employed.

There are two ways in which it could come into its own again; one would be as a slow-running, direct-coupled unit. In this case it would be necessary for the engine to be reversible, as a slow-running unit, developing, say, 1,800 h.p. at 200 revolutions per minute; if the machinery space were amidships, it could operate either on oil or on gas.

This calls to mind that there is a certain future for the gas-engined ship, and, as has been mentioned above, one of the outstanding vessels of 1942 is a ship completed for Danish owners. Though this ship is only of 3,000 tons deadweight, and has a six-cylinder, four-cycle, trunk engine, developing 950 h.p., she is nevertheless the first gas-engined ship built in Denmark, and the first sea-going gas-engined ship to have been constructed for many years; two main gas generators working on coal are fitted, the installation including equipment for breaking up the coal.

The engine is of the normal four-cycle type, except that it has no fuel valve or fuel pumps, and special inlet valves are fitted. The main generators supply gas for use when the vessel is at sea, but when she is in port, the auxiliaries are supplied by special small generators. The whole of the producer gas plant is installed forward of the engine-room, and occupies five

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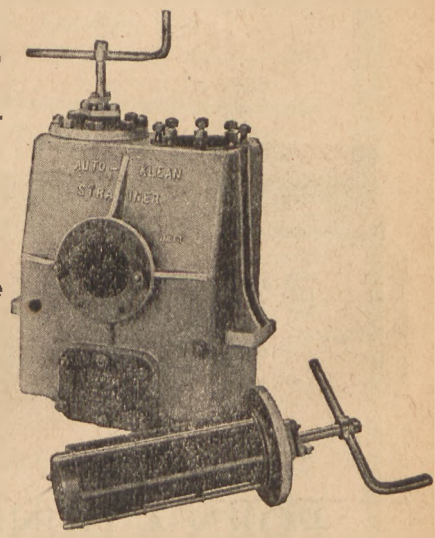

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frame spaces in which coal sufficient for 20 days' steaming is carried. Doubtless the ship is an experiment from the economic point of view, but should prove interesting to those countries which are able to use coal or oil as needed. Such a ship would have an important post-war advantage from this point of view.

There is little doubt of the gas-engined ship ever having any universal application. She will always be a specialist ship, mainly confined to coastwise and short sea trade. It is interesting to note, however, that during the year a suggestion has been put forward for a more ambitious equipment, for 4,000 h.p., the advantage of which over corresponding steam plant lies in the lower fuel consumption of the gas engine, namely, about 300 grammes per b.h.p. per hour, compared with 430 grammes per b.h.p. for the most efficient coal-fired steam plant.

Four high-speed gas engines driving a single shaft through gearing are envisaged, built for marine work as diesel engines, so that they can operate on producer gas at sea, with a special ignition charge of diesel oil, whilst all manoeuvres are carried out when running on oil. This dual system would not necessarily appeal to many owners.

For auxiliary purposes there are two engines and a steam unit, the steam being at low pressure and raised from the cooling jacket of the gas generator. Diesel oil is carried in the double bottom tanks, whereas the coal for the gas producers is in a W-shaped bunker, which straddles the middle of the engine-room, the peak of the "W" being on either side exactly at mid-length of the engine, i.e., alongside of the coupling. The compact producers are in the forward wings of the engine-room to port and starboard respectively. The machinery is amidships, and it is stated that it weighs 750 tons, the total space occupied being 3,300 cubic metres, though by the employment of two instead of four engines the weight space ratios are improved. Plant of this nature up to 5,000 h.p. can be developed on a satisfactory basis, it is added.

It is agreed that, while no gas engine plant of this size has yet been installed, manufacturers are now in a position to supply them. One difficulty to be overcome, however, is that producers cannot be designed to use varying grades of coal, and must burn either anthracite or certain qualities of coke. As it cannot be guaranteed that these special qualities will be available in any harbour, gas engine propulsion is not suitable for ocean-going ships, neither is it likely to be. It is submitted that it has considerable advantages for local and short sea trading, and that its advantages would be even more increased were it possible to "bunker" the gas in bottle form.

The gas engine suffered eclipse in the early days of its career at the hands of the oil engine, and because the coal industry did nothing to support its growth. After many years spent in obscurity, however, there seems to be a chance that it will come back into its own. In particular these war years will have taught us to do without many things, forms of propulsion included, that we thought were vitally necessary. This gradual conditioning of shipowners and shipbuilders to do without the old, and to improvise the new, will result in much that is so improvised remaining. It is reasonable to suppose that the gas-engined ship will be one of these, particularly on the Continent of Europe, where the fuel situation may grow worse rather than better.

There are many problems to be solved in the higher powers for gas-

(*Continued on page* 295)

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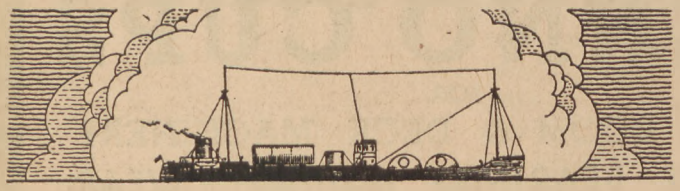

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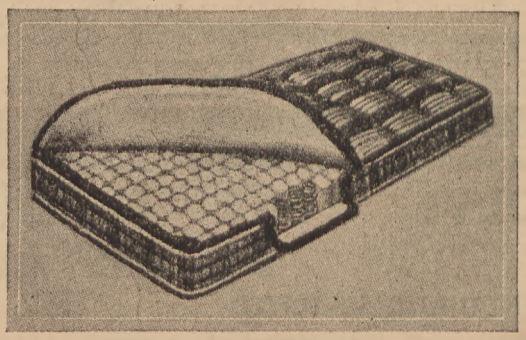

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"ASSEMBLING" applied to ... Ship Furnishing and Decoration

By W. A. GIBSON MARTIN

ONE of war's most revolutionary changes is that ship "building" has given way to ship "assembling." The post-war era may see immense glass-roofed factories, fed by railways, roads and conveyors, built astride a dry dock to which water may be admitted—when the ship has been completed—from an adjacent river.

In their determination to accelerate production the United States shipbuilders have thrown overboard all conventional methods by constructing hulls upside down and making superstructures in a factory a few hundred yards—or, if necessary, a few hundred miles—away from the final assembly point. Already the ship "yard" is becoming the ship "assembly shop," a development with far-reaching effect upon the decoration and furnishing of accommodation for crews, officers and passengers.

"Assembly" of finished component parts, as distinct from "building" with materials in a more or less raw state, involves much closer co-ordination between every section of industry which serves the shipbuilder. Not only must the accurate dimensions, weight and finish of every item of equipment be determined at a stage much earlier than has been usual hitherto, but fixing points must be provided if—indeed—holes are not bored for bolts and screws before every component passes into the assembly shop.

To a limited extent, of course, this policy has already been adopted successfully in Great Britain as the result of Admiralty insistence upon rapid conversion of ships from cargo to troop carriers. For instance, some time ago the writer saw such a conversion in 48 hours. The owners had had several weeks' notice, enabling certain joinery shops to pre-fabricate most of the woodwork and have almost every detail in readiness to assembly on board as soon as the ship docked. A picked team of carpenters—who had already converted ships of a similar size and type—had only to put down wood floors in the holds and line the ship's plating before positioning and securing the various benches, tables, forms and hammock supports.

This same principle, systematically developed, is now being applied to the assembly of complete new ships, except that a sharp distinction has been drawn between equipment which is permanently secured to the ship's structure — beds and wash-basins, wardrobes and dressing mirrors—and those which can be put aboard after the ship is completed—easy chairs and dining tables, coffee tables, rugs, cushions, lampshades and curtains. In this second category fall certain items which have a temporary fixing. Dining tables and chairs are usually anchored to avoid undue movement in bad weather so that the pre-fabricated floor unit must have openings to which the fastenings may be secured.

Although curtains and carpets are

(*Continued from page* 293)

engined ships, particularly the auxiliary question. A dual fuel is always undesirable when the two systems are required at once; as we have seen, there may be many cases when this is so. A low fuel consumption compared with coal-firing may thus, and for this reason, lose its attractiveness.

Indeed, it might well be argued that many of the schemes discussed, having for their end a compression of machinery space rather than any specific reduction in tons per 24 hours, are inacceptable to the practical shipowner on the ground of complication. Therein is the great danger; from a marine oil engine point of view, however, this danger is common to all types of propulsion, and if any engine-room is likely to get more complicated as time goes on, then it will be the steam engine-room rather than the diesel. If the future of steam lies in the development of high pressure, high superheat water-tube boilers, with controlled combustion or of forced circulation boilers, with even higher pressures, and requiring special kinds of feed water, then surely the engine-room of to-morrow will be a laboratory as much as an engine-room.

So it may well be, in spite of what has been said above, that there will be a revision to simplicity in the future, with perhaps even a return to the simple, robust steam auxiliary. The answer to this question lies to some extent with the electrical companies, and even more so with the material that they have at their disposal after the war. A "bottleneck" in copper, for example, would make the quick and ready supply of winches and contactor gear rather difficult. This, however, is anticipating difficulties which may not, in fact, exist.

We can say that although, after the war, it may be found that the curve of motorshipping has not been so "upward" as in peace-time, due to a variety of obvious circumstances, the oil engine will be just as popular in immediate post-war years for certain types of ships, as it was in pre-war years. The cargo liner is likely to remain a motorship, though there will be strong rivalry from the geared turbine and water-tube boiler. The tanker is almost a sure case for oil engine propulsion, unless speeds of, say, 21 knots are called for.

The passenger liner field is a difficult one upon which to make any pronouncement, because until we can see just where the influence of aircraft is going to begin and end, we do not know what the likely calls of shipowners upon passenger liner constructors are likely to be. All the circumstances suggest that the day of the very large trans-Atlantic liner is over, but then we must remember that these ships are not very big for the sake of mere size, but the smallest which can do the job profitably in the quickest time. In any case, the 80,000-tonner was never a target at which the oil engine seriously aimed.

In the coasting and short sea trades the standard oil engine is likely to make progress for some time. It is to be hoped that in post-war years all British designs of oil engines, which surely will have had a chance to prove their merits during the war years, will be retained. Tugs and small craft will also have benefited so much from the compactness and low fuel consumption of the oil engine that it is difficult to imagine them turning away from it, though Mr. T. Shoosmith, in his paper to the Institute of Marine Engineers, held out a very attractive proposition on behalf of coal burning for tugs of Thames type. Presumably this particular design is equally capable of being extended to other designs, of larger types.

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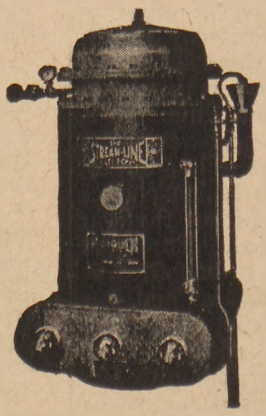

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normally installed after a ship has been completed, yet these items must be included as integral with the original plan. An efficient suspension method for the curtains must be selected and arrangements made for attaching the fittings: these may be of metal or plastics, employing runners or rings, running on rails or rods, but the necessary points at which those fittings are to be attached, and the means of attachment, must all be planned in advance and the essential holes made for brackets, screws and supports, at some convenient stage in the assembly. Again, if carpets and rugs are to be held in position by pins and sockets—as is usual—then the floor unit must be equipped with sockets at precisely the right places so that the fitter when he comes aboard knows exactly where each socket is and can lay all the floor-coverings within the prescribed time limit.

* * *

The decorator's task would be comparatively easy were fabric units divided horizontally, i.e., deck by deck. But horizontal divisions seem to be exceptional, especially with superstructures where a lounge or smoking-room may be split either length-ways or athwart the ship. This certainly eases the problem of uptakes and officers' quarters adjacent to the bridge; and although it may complicate matters considerably yet must be accepted along with many other new conditions which will change all pre-war principles in both design and construction.

One effect of ship assembly can be anticipated quite positively, i.e., the virtual disappearance of elaborate period apartments. For instance, in 1938 and 1939 the trend was towards more elaborate and highly decorative furnishings, a typical example being in the *Dominion Monarch* with its return to the "drawing-room" and the "old oak" smoking-room. It seems quite obvious that the post-war ship will adopt a more modern scheme altogether; yet one can foresee an occasional private dining-room, or perhaps a suite-de-luxe, decorated in one of the classical styles, more as a novelty than anything else, as a museum piece employing methods more costly than would be justified in an apartment exposed to the severe everyday use by large numbers of passengers who normally rely upon the lounge, dining-room and smoking-room for social intercourse. These apartments, however, need not be ultra-austere; in fact, it is imperative that they be thoroughly comfortable and as pleasing to the eye as they are practical in design. But their practical design will involve certain economical finishes and certain rapid refitting principles which cannot be adopted in a period scheme.

Although no new passenger ship has been put into commission for three years or more, yet clubs, hotels and houses have been designed and completed ashore during that time; so one is not without some fairly clear indication of changes in public taste, quite apart from the impact of war and all its consequences.

Decorative schemes have been carried out in non-belligerent countries—and in U.S. before Pearl Harbour—all of which have one significant feature in common, viz., all ignore the classical styles and give free rein to pure functionalism relieved, to a limited extent, in the modern fashion by contrasts in texture, colour, and line. This feature cannot be credited entirely to war conditions; in fact, one must conclude it is not influenced in any way by war conditions, for none of the countries concerned had any difficulty (at the time such interiors were completed) in producing highly satisfactory period schemes if such were demanded. One may conclude, then, that the arts still continue to develop in the minds of men and of nations, even although temporarily deprived of normal expression in belligerent countries.

Quite apart from war and the throttling of all natural artistic development, however, this new adoption of ship assembly on a big scale will in due course enable the ship decorator to make an entirely fresh start, abandoning all principles and all traditions which do not readily adapt themselves to the new construction.

The basis of all assembly plants being maximum standardisation of parts, it is but reasonable to anticipate that standardisation will be adopted on a big scale in decoration and equipment; not only can the movable items—such as tables and chairs, basins and beds—be standardised to an extent far beyond anything visualised in pre-war years, but floor and wall finishes, electric fittings and galley equipment, ventilation and plumbing, are all capable of similar developments with certain obvious and practical advantages extremely welcome to the shipowner.

Yet it must not be assumed that standardisation itself is anything new. On the contrary, a Liverpool firm owning and operating a fleet of 85 ships has standardised all its bed linen, bunk curtains and chair covers for several years. The linen department maintains ample stocks in readiness for ships reaching port, and in many instances a ship has had its soiled linen removed and replaced with a completely new supply within 24 hours of arriving in Liverpool. Exactly the same principle may be employed in dealing with chairs and mattresses, tables and floor coverings. Although in pre-war days the firm to which reference has just been made had built up its fleet slowly, ship by ship, in the post-war era it seems evident that dozens of different firms will be demanding hundreds of chairs and tables, beds and basins to re-equip their ships for normal traffic.

Despite the average man's dislike of "standardisation" in the home, he has now to accept "utility" furniture if—through enemy action—he is compelled to refurnish his house, or if he decides to become a householder for the first time. Allowing for all the delays and difficulties so typical of negotiations with a Government department, the committee has accomplished its task with reasonable speed and efficiency.

Several furniture manufacturers have been selected to make this utility furniture, some of which may be issued to the public early this year if, indeed, a few items are not released before these lines appear in print. Never before has the British public been so restricted in its choice of furniture and never before has the furniture industry been more critical of a Government attempt to mould public taste.

Taken as a whole, however, and bearing in mind that we are at war, which demands much self-sacrifice and may well demand much more, the utility tables, chairs, settees, and bedroom articles are much more satisfactory in design and construction than the average sold in this country by hire purchase during the immediate post-war years.

The committee (chairman, Mr. Chas. Tennyson, C.M.G., late deputy-director of the Federation of British Industries) was assisted by well-known designers amongst whom may be mentioned the following: Messrs. Grey Wornum, F.R.I.B.A., Brian O'Rorke, M.A., F.R.I.B.A., and John Grey, F.R.I.B.A. Members included Messrs. Gordon Russell, Herman Lebus, F. C. Hooper, and W. Johnstone.

The manufacture of ordinary furniture was prohibited after November 1, but goods in process of manufacture on that date were allowed to be completed, provided that this could be done by December 31. After that date, the only furniture to be manufactured in Britain for domestic purposes will be that which conforms to the utility scheme introduced by the Board of Trade.

It would be entirely wrong, however, to assume that utility furniture will be available in large quantities or that

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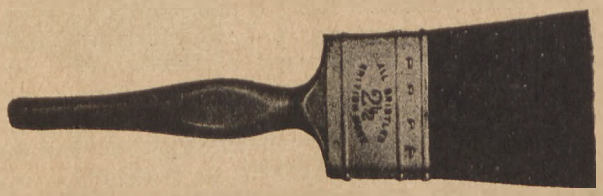

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anyone can adopt mass production methods of manufacture. The entire scheme has been designed to reduce consumption, to telescope factories, to withdraw labour for war purposes, and to ensure that no one is allowed to purchase new furniture unless he has lost his home as the result of enemy action or, in rare cases, he is setting up house for the first time.

Yet the designs are all so perfectly straightforward and so well-fitted for the purpose that they would be found suitable for at least 75 per cent. of "newly-weds" in almost any country in Europe. These designs show how much labour and expense could be saved by standardising a straightforward design so that it may serve in several apartments in hundreds of ships. Mr. Hugh Dalton, as President of the Board of Trade, has given a most useful hint to shipowners by this scheme. If a design can meet the tastes and needs of 75 per cent. of the public, surely it is worth while considering something of the kind in ship furnishing?

Now is the time, therefore, for shipowners to discuss what type of chair and table will be most suitable for ship equipment, and to agree upon some standard designs which furniture manufacturers — eager to resume peace-time trade—can produce without any great delay. Chairs will be wanted to equip the dining-room, lounge, and other public rooms, also for private cabins, officers' quarters and open-air accommodation: for example, sports deck, enclosed verandah and promenade decks.

Of these, which will be required in a quantity sufficient to justify standardisation? To begin with the dining saloon: here two designs might be standardised. First, a comfortable arm-chair for first-class accommodation. Secondly, a more compact but still comfortable chair for tourist and other classes, preferably without arms and of rugged construction capable of withstanding really hard usage. The first design could be used for the captain and senior officers' quarters, perhaps for a writing-room or for use with a writing-table in the lounge. The second would be suitable for other officers' quarters and for general use throughout the passenger accommodation apart from the first class.

Wide scope exists for the standardisation of tables. Take, as a unit, the normal size of dining table for two, approximately three feet square. Any good furniture designer can produce a frame of robust construction, amply braced to withstand a long period of service at sea, equipped with some easily attached bracket and slide which would enable the stewards to group the tables to suit passengers' needs. Two tables fastened together would accommodate four, five or six passengers: three tables, six, seven or eight passengers: and so on. Dining tables would have plain tops, or tops covered with easily renewable felt or baize—easily renewable because the top would slip off, when required, for fresh covering.

This same design of table, with another type of top, would serve in the smoking-room, in the writing-room and for card-playing as well. The top can be veneered with plywood and plastic to resist alcohol and cigarette burns; covered with baize for card-playing; and polished and then fitted with stationery racks for the writing-room. A single design would serve all classes of accommodation in the average ship, but if a table 30 inches square would prove more suitable for all-round purposes, then the first class passenger would have to sacrifice three inches elbow room on each side—not a very serious matter—or else a special size might be made for the first class dining-room alone, outside the general scheme of standardisation.

Most ships have certain standardised bedding throughout, but all ships belonging to one particular company had not become standardised to the extent to which they could have been. In pre-war days the spring-interior had become almost universal, and all ships not originally thus equipped were being brought up-to-date as rapidly as conditions permitted. Even so, bedding manufacturers had to cater for dozens of slightly different sizes and qualities whereas the shipping industry could have purchased bedding on a more economical basis by adopting half-a-dozen qualities and not more than two sizes.

De luxe suites, with twin bedsteads and other ultra-luxurious equipment, may be omitted from any standardisation scheme. Undoubtedly, these will require renewal in due course; but their number is quite insignificant as compared with the number of ordinary cabins which must be provided with new bedding on resumption of normal passenger traffic.

The first size of spring-interior should be suitable for all first-class accommodation, apart from the de luxe bedrooms just mentioned. It should be the very best obtainable, capable of giving a long period of service at sea without any attention apart from periodical examination and re-covering. It should fit all first-class berths; and it is assumed, of course, that shipbuilders and shipowners will have already agreed on some standardised size of berth to be adopted throughout all passenger ships operated by the united nations.

The second size of spring-interior mattress will be slightly smaller, designed for other classes and for officers' quarters. A series of six qualities has been suggested so that shipping companies might have a choice, some preferring softer mattresses, others paying more attention to the exterior ticking and others again demanding a quality giving the maximum wear-for-money. Similarly, certain technical standards can be established for a range of pillows, bolsters, blankets, sheets and pillow-cases.

There may be three types of easy chairs standardised. First, the luxurious out type for first-class lounge and smoking-room, a compact but thoroughly comfortable chair comparable with the best pre-war type. Secondly, a smaller but just as comfortable chair, perhaps of the tub variety or on similar lines to it, shorn of upholstery embellishments and finished in a simple style evolved to facilitate re-fitting. This easy chair would be suitable for all classes apart from first (although perhaps appropriate for certain first-class bedroom accommodation) and for all public rooms (e.g. writing-room or library) as well as lounge and smoking-room, and for the captain's and senior officers' quarters. Thirdly, a utilitarian easy chair, occupying a minimum amount of floor-space and finished on strictly economical lines, for general use where space is limited or where the accommodation does not justify anything more luxurious.

Having standardised the type of chair, the structural parts can be standardised with still greater benefit to the shipowner. A chair comprises three main parts, viz.: frame, upholstery and covering. Already much has been done in reducing the variety of frames but much more ought to be done in post-war years, as probably half-a-dozen designs would meet the needs of 99 per cent. of the world's shipowners, resulting in a vast saving of manufacturers' time in designing, machining and finishing.

As for the upholstery, it will be a simple matter to design and manufacture a dining saloon chair seat-bottom, completely upholstered with webbing, hair, springs (where required), scrim and canvas, in lots of thousands at a time, all ready to be covered with tapestry or leather and delivered on board where stewards can drop in the seats as easily as they whisk away an empty soup plate. The covering varies, of course; *that* is the one method of avoiding standardisation's gravest obstacle, viz: lack of individuality.

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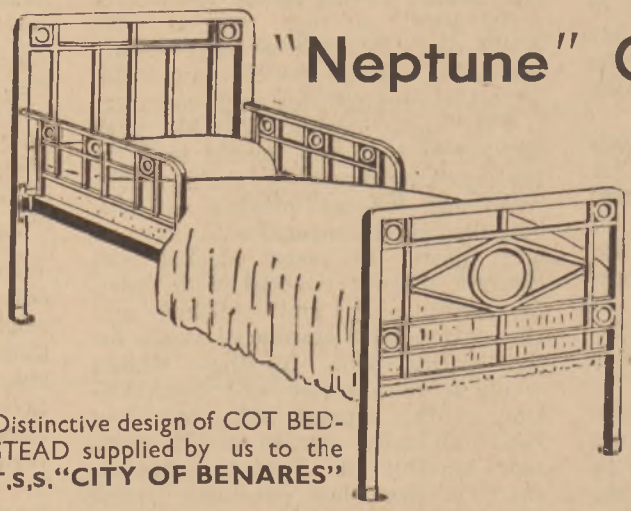

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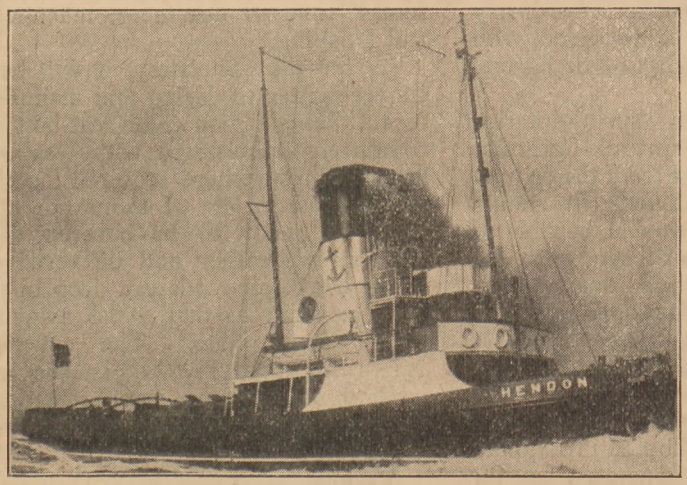

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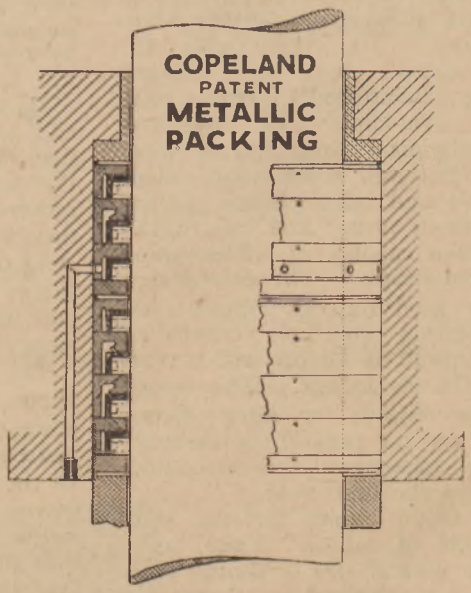

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followed by woven fabrics such as tapestry of various qualities and moquette, the latter often uncut. If frames and upholstery units can be manufactured by the thousand, as they can, the slight extra cost of individualising the covering, in lots of a hundred or two at a time, will not interfere seriously with either the economy or the utility of standardisation.

Easy chairs can be designed on similar lines, having a standardised seat, back, and units for the arms, each of these three sections being complete in itself and finished all ready to drop into the frame, where it will be secured by some simple form of metal fastening. Seats and backs can be constructed on the spring-interior system, with springs protected by fabric pockets so as to eliminate all noise; these seat and back units are built on a strong metal framework with steel laths of specified resiliency to support the coil springs. Much pre-war development was on individual lines, each factory turning out its own designs—sometimes 20 or 30 of these designs, all different, produced by each of a hundred upholstery manufacturers. If reduced to half-a-dozen types and the production multiplied by several thousands, the price of upholstery " sets " can be reduced to a level which will attract shipowners all over the world.

Another pre-war trend—the horizontal coil spring—must be kept in mind. Here the spring was being extended or expanded when in use, whereas the normal vertical coil spring is under compression when a passenger sits on the seat. The horizontal method occupies less space and simplifies upholsterywork, especially when used in the backs of chairs which do not support the entire weight of the passenger. In many current designs the horizontal spring used for the seat is so applied that hair and webbing are eliminated, while the depth of the seat is reduced by five-sixths or even more in some cases. Moreover, the chair is lighter, and replacements much easier. This type of upholstery also lends itself to standardisation as a sub-frame could be made and fitted with the spring assembly, all ready to drop into an easy chair frame.

Covering of easy chairs may be any one of the hundred or more attractive fabrics available to shipowners, from leather and hard-wearing moquette with a cut pile to the decorative and more expensive fabrics such as damasks, tapestries and embroideries. For de luxe apartments, the shipowner may follow pre-war practice with individual coverings, permanently upholstered, and a well-tailored loose cover of block-printed linen.

For standardised chairs, however, it is doubtful if conventional coverings can be justified. The ideal would be a soft cover of felt or baize, taking the place of the usual permanent covering. Then, on top of this soft cover would come a well-cut loose cover, each chair having a duplicate cover to use or replace the original when it becomes soiled. If produced on a big enough scale these loose covers could be made to fit the standardised easy chair perfectly and at a cost less than one-half of the pre-war price.

As in these present war-torn days, when £ s. d. has become of less importance than ever before, so in the days to come mere money will be secondary to the time element; the sooner a ship can be equipped and put into traffic the sooner will its owners receive a dividend. Consequently almost anything is justifiable if it will accelerate the recommissioning of ships. *Time* and speed are of more importance than the cost of equipment. Shipowners to-day, therefore, may find it profitable to give some consideration to their post-war needs and to plan some comprehensive standardisation which will save time,

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accelerate the putting of ships into peace-time service, and still maintain the pre-war reputation for comfort in both the public apartments and sleeping accommodation.

The standardisation of furniture will simplify the making-up of bedspreads, curtains and chair covers; yet this same standardisation need not result in monotony nor need any ship lose her individuality insofar as the artistic effect of passenger accommodation is concerned. Ample scope will still exist for the use of rich fabrics in de luxe rooms, and for well-chosen but hard-wearing material for other classes. Although size and quality may be unified, an individual appearance can be provided by varied coverings, and neither the shipowner nor the discerning passenger need anticipate monotonous interiors if full use is made of the innumerable ranges in design, colour, and texture almost certain to be available when weavers and printers revert to normal production.

Many of the smaller fittings ought to be standardised, from water-taps and tumbler holders in cabins to the curtain rail and curtain tape in every curtain throughout a ship. Something had already been achieved along these lines, as plastic fittings became popular and were restricted to a limited number of designs. There had developed a tendency, however, for shipowners to demand individual designs, introducing slight variation which meant new dies and presses, adding considerably to the all-in cost without giving any advantage whatever, apart from a fitting slightly different from that used by other shipowners.

If ships are to be refitted rapidly and put into service with a minimum of delay after release from war service, this trend must not be permitted to develop. For rapidity in making-up curtains a standardised form of draw tape should be adopted throughout the industry. This eliminates hand-gathered work and simplifies the finishing of all except the heaviest type of curtain—e.g., the proscenium curtain in a big liner's cinema or lounge with stage for dramatics and cinema shows.

The pre-war method of built-in wardrobes in suite-de-luxe accommodation may be extended to all sleeping cabins and berths, the wardrobe doors being finished a light shade to correspond with other walls. The wash-basin should be similarly treated as well as any chests of drawers, tallboys or other clothing accommodation. Dressing mirrors may be recessed in the wall and arranged to pivot from their lower edge—if mounted high up—with an easy means of adjustment to suit the passenger's height.

Still further experiment must be carried out in sleeping accommodation design, for the ideal still eludes most naval architects. Instead of starting with one cabin having four walls and then trying to group the wardrobe, wash-hand basin, bed or berth and door in a way which will suit.

(1) production methods
(2) the general scheme of uniformity throughout the ship
(3) and the passenger's convenience,

a start must be made with several cabins, perhaps in blocks of four or eight or 12, with a double wall between each.

Part of this double wall will make a recess for the wardrobe in one cabin, and the other part will provide wardrobe accommodation for another cabin. By careful use of these spaces in walls, each cabin will be more convenient, more easily equipped with standardised furniture, cheaper to finish and simpler to keep clean during voyages. Spaces in walls, where not used for cabin furniture may serve as

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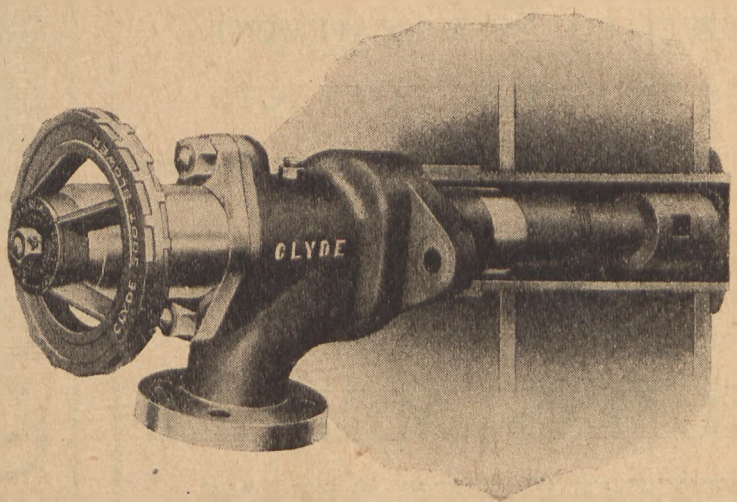

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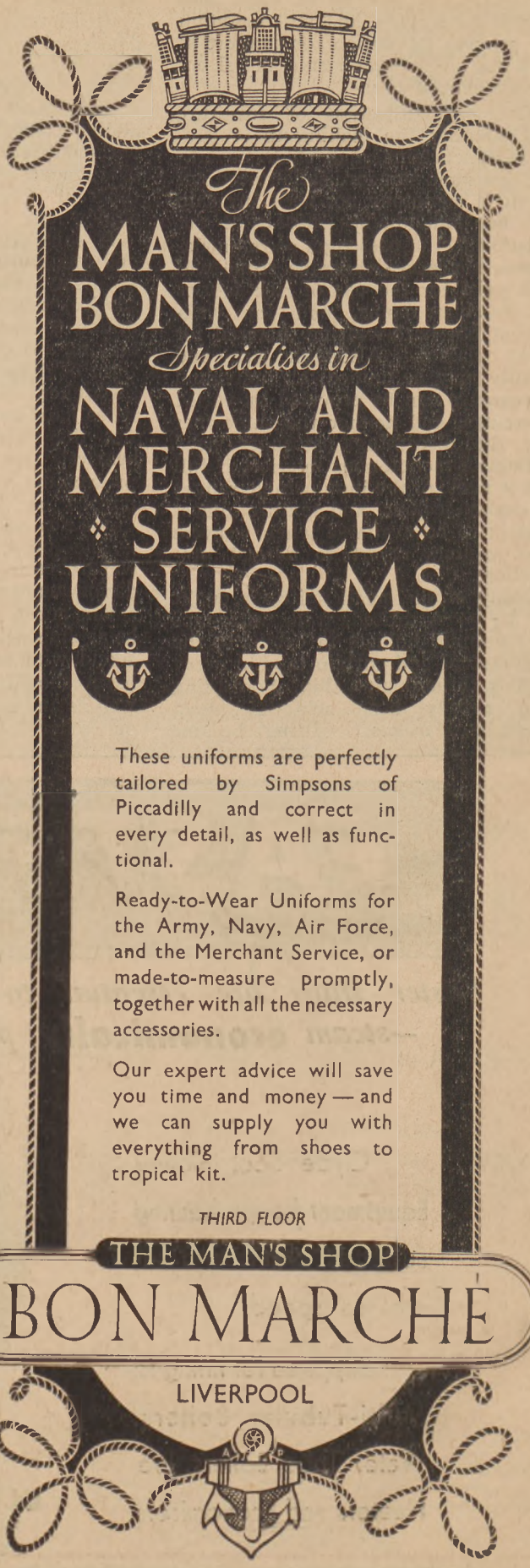

cupboards for the stewards, or for fire-fighting equipment or life-saving apparatus, thus saving space in the alleyways and—if fitted with glass doors—always on view, rapidly found in an emergency, yet not offering harbourage for dust.

If the shipping industry can establish a system of standardisation, perhaps a special committee of shipowners on which all passenger lines are represented and if all shipowners agree to use nothing but recognised standardised goods on all their ships being recommissioned for passenger traffic and on all new passenger ships for a period of 10 years after the cessation of war, then the cost of re-equipping ships will be greatly reduced and the time involved will be less than anyone dare anticipate to-day.

* * *

For de luxe accommodation, however, there must be—and, no doubt, always will be—a need for really exclusive treatment, utilising specially designed furniture, ultra - modern fabrics and mural treatment as novel as the mind of man can evolve. The great liners of pre-war days have shown how delightful the de luxe interior can be; even with 20 or 30 suites-de-luxe, each one can strike a completely individual note, each one an artistic triumph in itself. What will the post-war ship offer to the passenger who demands de luxe accommodation?

One obvious development is to begin with the mural treatment and, having evolved something quite exceptional there, to fit the furniture and fabrics into the framework set by the wall.

For instance, there is the case of a New York hostess who had her portrait painted in ski kit. The resulting picture proved so colourful that it completely failed to harmonise with any existing apartments in the New York mansion. So a large room was cleared of all furniture, carpets, and hangings, the walls painted a sombre grey, and the new portrait hung above the fireplace. A decorator was then called in, told to design walls, floor, hangings, and furniture in harmony with the portrait, and given a free hand as to the general effect. This experiment proved thoroughly successful, and to-day there are dozens of apartments in America which have been taken a picture or other work or art as the focal point, making everything also in the room subservient thereto.

In many British ships, of course, there are striking pictures and thoroughly pleasing mural panels, carefully chosen by the decorator and merging smoothly into the general colour and decorative scheme. Usually, however, the picture was chosen after, and not before, the apartment had been designed in detail. An entirely new effect is obtained when the picture is chosen first and the remainder made to harmonise with the picture.

Is this, by any chance, the way to introduce a new sea effect into passenger accommodation? For too long, now, the big passenger vessel has been a copy, more or less, of lavish accommodation ashore; and only one architect—Mr. Brian O'Rorke—has been courageous enough to break away from this convention. Mr. O'Rorke announced that he would make the interiors of the *Orcades* as nautical as possible, and he certainly gave a delightful nautical flavour to many details in his decorative schemes.

Quite a different effect, however, could be obtained by taking a big seascape as the central theme of a lounge. Give it the place of honour on the walls and build up the colour scheme of correspond. Make a " focal point " of the

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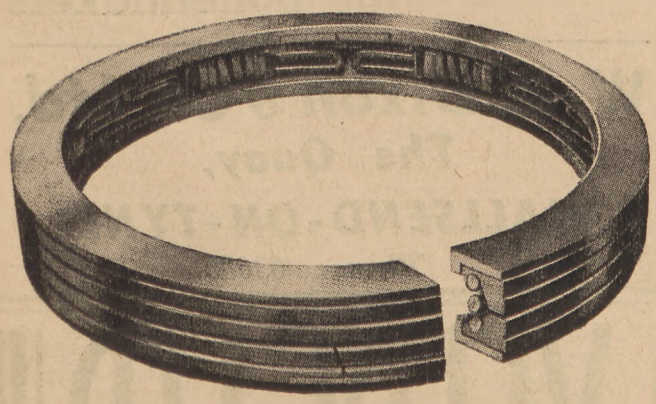

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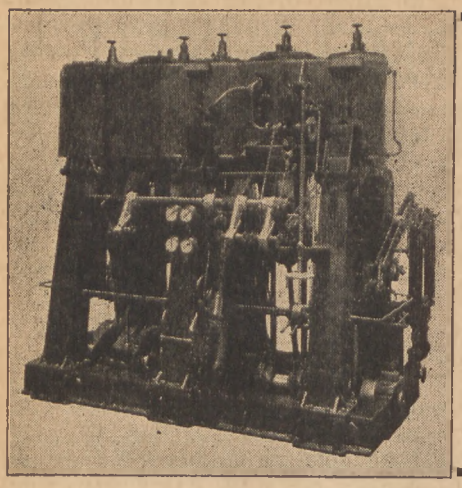

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picture—let its sweeping blues and rich bronze-greens be repeated in softer hues by floor and walls, with a mere tint to bring the ceiling into line. Let rich velour hangings repeat the white-crested edges of the waves, and use contrasting bandings to hint at the ever-varying sheen of the deepest sea-blue. Perhaps there is a man-o'-war in the distance, her flags introducing one or two of the primary colours—these can be repeated, emphasised, made more effective by similarly-coloured cushions, carpet details, and curtain trimmings. The setting sun sends its warm glow over the sky, a generous golden yellow which can be used to tint the walls, enhance the effect of mouldings and find an echo in the furniture coverings.

Much has been promised in new materials for the post-war era. Some of these promises have little or no practical basis, depending—as many of them do—on some extensive research and development not yet begun. Others again may be within the reach of economical production but must of necessity require a considerable time—after war's cessation—to become available in quantity and at a reasonable price. One must conclude, therefore, that ships put into normal traffic during the immediate post-war period will be equipped with materials and in a style similar to those of 1938 and 1939 or as near thereto as manufacturers can approach.

Amongst the "new" materials which promise to revolutionise industry are plastics. But, as has been emphasised several times in the columns of *The Journal of Commerce and Shipping Telegraph* many of the claims made for plastics may not be substantiated for years. The science of plastics is still in the infancy stage. While it is true that almost everything can be made in one or other of the various substances known generally as plastics yet in many instances the plastic article will cost far too much, or be too difficult to produce in economical quantities, or offer no great advantage over the original wood or metal. Those who exaggerate the scope of plastics do a grave injustice to an undeveloped industry. Yet undoubtedly there is a big future for plastic articles, always assuming that the essential pioneer work is accomplished and that fantastic claims do not create a bad name for the material before it is perfected.

One of the most promising new materials, of course, is glass. Undoubtedly glass will figure more prominently in ships designed and completed four or five years after war ends. Walls may be constructed mainly, if not altogether (as in sun verandahs and sports enclosures) of glass, thereby saving space and providing the maximum amount of light. By using curtains, running on metal runners all round the apartment, any wall or walls may be rendered opaque, and may be arranged to admit the sun or exclude the sun, just as may be required. The folding screen, consisting mainly of glass panels (as is used occasionally at the after-end of smoking-room or dance-space) will probably be used for other apartments and for bulkheads running lengthways as well as athwart the ship.

Interesting developments may be expected in fabrics, especially with those introducing a weft of glass or plastics, both innovations having passed the experimental stage and having gone into production just before United States became a belligerent. It is too early to state that these unconventional fabrics will positively retain their original attractive appearance, colour and general effect but one may say that such fabrics will give exceptionally good wear and will be easier to keep clean than any woven fabric available to shipowners in the pre-war era.

Ship furnishing in the post-war years will be influenced to some extent by aircraft furnishing. Although there is less need to save space in a ship's passenger accommodation, yet space saving is always welcome, especially on cruising vessels and on long voyages. By reducing the size of his furniture without limiting its comfort or appearance, the shipowner exploits still further one of the basic advantages of sea travel, viz., *freedom of movement.*

Neither train nor aeroplane can compete with the average ocean liner in this respect. No other form of travel can provide sumptuous comfort for 1,000 passengers, including cinema with proscenium and stage equipment for presentation of plays, open-air swimming-pool for good weather, indoor baths for colder climates, gymnasia for men and women passengers, and at least one other large public apartment as well as the dining-room and lounge. This third apartment is usually a smoking-room, but there may be others almost as large—a dancing space, for example; then it is quite usual to utilise a corridor or passageway as library or writing-room, and another space may serve as drawing-room or chapel. No matter what size those apartments may have been originally, their utility depends mainly on how much floor space is available for moving about.

Aeroplane furnishings are designed primarily to occupy as little space and to be as light in weight as possible, consistent with adequate comfort. Much has been done to "tidy up" the design and finish of easy chairs, using new materials and different styles. Although the shipowner cannot expect to attain success in this respect by adopting any existing aircraft types as they stand, yet he can gain some idea of how to adapt his pre-war designs to post-war conditions.

Reference has already been made to the use of horizontal coil springs in upholsterywork. These save space and weight. Shipowners had discarded pneumatic upholstery as unsuitable for lounge easy chairs; similarly, rubber in its various forms had been discarded. But have these ever been tried in combination with each other or with coil spring supports? Assuming that rubber or rubber substitute is available in a limited quantity for post-war industries of first importance, have we not here a natural and indeed ideal substance for reducing bulk?

It seems probable that research, already making good progress before war broke, will soon place at shipowners' disposal a material much more resilient than hair and springs, yet occupying less bulk. The triple-sprung settee or easy chair, for example, demands a depth of 10 to 12ins. for the satisfactory positioning of layers of springs, hair, and scrim with their attendant webbing, twine, and canvas. It is not too much to expect an upholstery method which will reduce this to 3ins., or even less, without any sacrifice of comfort and having the further advantage of being easily renewable. In addition, it may be that the post-war materials will be less inflammable than anything previously offered to the shipowner, a point of great importance to aircraft operators as well.

The problem of putting ships into commission again, after their release by the Government, is one which cannot entirely be left until the Armistice. Despite the innumerable demands made upon the time and energy of shipowners during war, a determined effort ought to be made *now* towards the formation of an after-the-war schedule for recommissioning ships, including their redecoration and refurnishing. Designs can be prepared, discussions can be held with other shipowners as to some standardisation scheme for the industry as a whole, and the groundwork laid down for rapid progress as soon as furniture manufacturers and decoration specialists are ready to accept private contracts.

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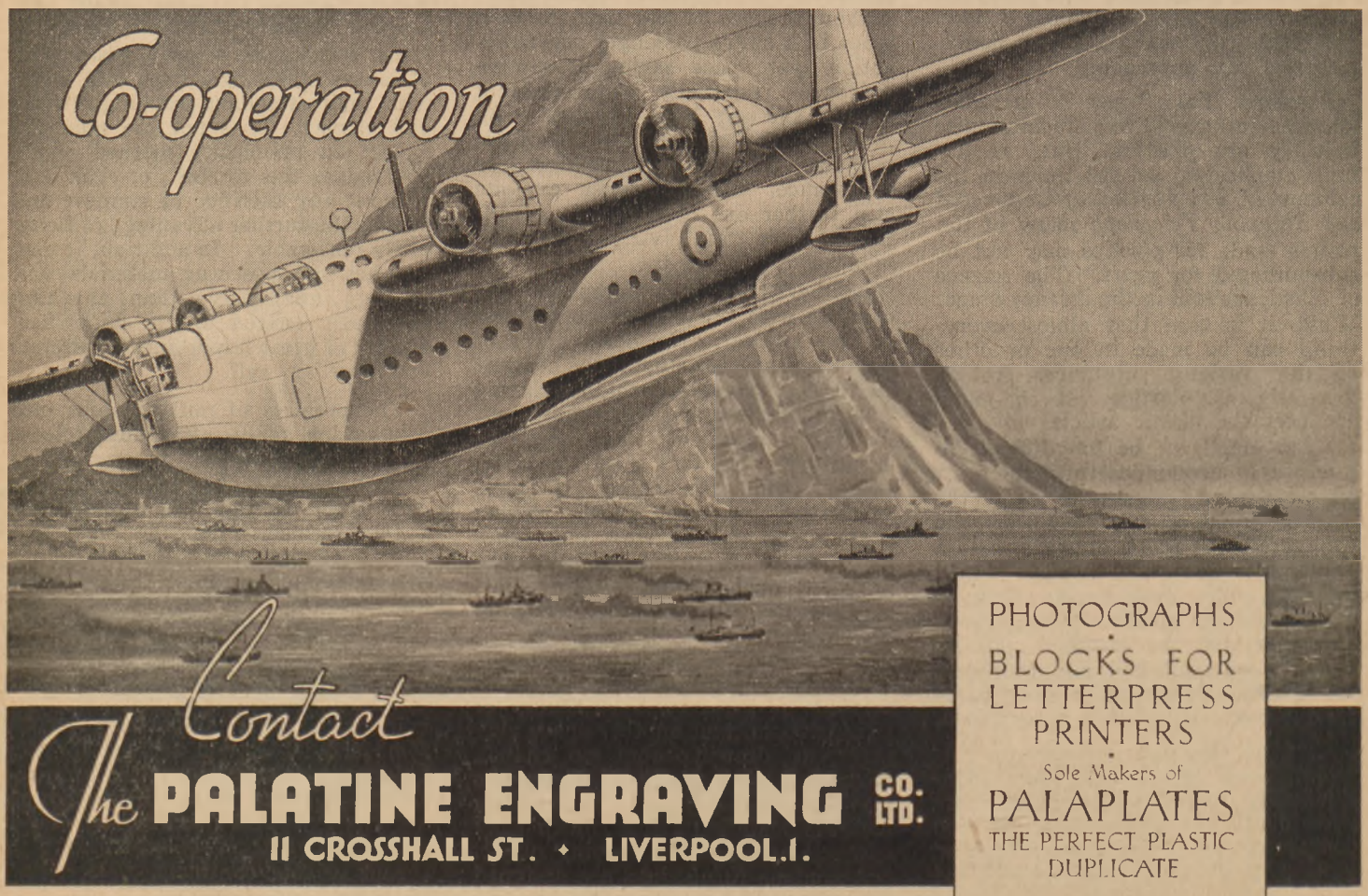

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Even in peace time the last-mentioned aspect of advertising was many-sided. For instance there was advertising directed to further the sale of specific goods or services as opposed to the expenditure upon advertising which was laid out chiefly as a means of supporting the trade Press. It is axiomatic that any industry has the sort of trade Press that it deserves —just as a nation is said to be inflicted with the type of government it merits.

In every industry one finds trade papers more or less flourishing in accordance with the volume of support afforded to them by the recognised leaders of the industry concerned.

To act as the mouthpiece of a great industry is a high vocation and one that requires brains, enterprise and a keen appreciation of journalistic values if it is to be truly efficient. Granted these factors, it is important that the large firms should recognise the fact and should support their trade papers 100 per cent. A virile trade Press cannot exist otherwise, and if the industry is not prepared to support its trade Press it does not deserve nor will it enjoy the full advantages that it would otherwise gain.

To consider a specific instance, one does not think it likely that any one of the country's large shipbuilding establishments has ever received a direct order for a new ship because that particular firm regularly and consistently advertised in the shipping or shipbuilding trade Press. One cannot conceive a British shipowner writing to a British shipyard in such simple terms as these:—"Dear Sirs,—We have seen your advertisement in the '——' and are so impressed that we would like you to build our next ship." Shipowner and shipbuilder alike, however, probably feel that the shipping Press fulfils a useful purpose, although they would not expect it to bring buyer and seller together in the manner indicated.

On the other hand, the technical and advertising columns of the pages of the Press do promote the direct sale of certain commodities and also help to find cargoes in peace time or protect shipowners' interests in loading rights at ports mentioned in the advertisements. Manufacturers of ancillary equipment, pumps, furnishings, navigational instruments and a host of other items find the trade paper of invaluable help in assisting their salesmen "on the road." Trade advertising of the kind just mentioned will not sell goods by itself but it will pave the way for the salesman—be he traveller or managing director — by constantly reminding the prospective purchaser in his quiet moments in the office, in the train, in his home or wherever he reads his trade paper that something new demands his investigation or reminds him of something that might otherwise have been forgotten.

Shipowners and their superintendents are among the world's most conservative business men and it takes a lot to convince them that there is any merit in making changes. Time and progress march on more quickly in the engineer's brain than in the shipowner's. Perhaps it is as well. Seafarers are engaged in a constant struggle with a treacherous enemy and eternal vigilance is the price of safety at sea. Therefore, says the superintendent, why depart from what is well known and well-tried?

Nevertheless progress is being made. "Audemus dum cavemus" is the appropriate motto. We have seen in recent decades the improvements in cargo steamers' lines, the introduction of oil firing and of the internal combustion engines—great advances pioneered by keen engineering brains and "sold" by enthusiastic salesmanship plus consistent advertising.

In the midst of all this, in September, 1939, came a complete change with the virtual elimination of competitive effort—in the capitalist meaning—from shipping, shipbuilding and marine engineering. Shipowners were not allowed by the censor to advertise their sailings, even if the appropriate Government Department permitted them to despatch ships on commercial voyages. Shipbuilding and marine engineering yards were at once filled with orders for new tonnage to the limit (and above) of their capacity. Why continue to advertise?

It is obvious that immediate benefits could not accrue but most firms realised that lasting benefit was of greater interest to them, so they have continued their Press announcements, but in many instances on a reduced scale. That may be summed up as the position as it existed after three years of war. It expresses, too, the calculated decision of keen business men responsible for the conduct and success of our leading industries.

More recently, however, by rulings emanating from the Treasury, shipowners have been virtually precluded from continuing their previous scale of advertising, and it is a curious paradox that the Government which has established public relations officers and staffs in almost every department and which indulges in advertising to a far greater extent than any of its predecessors should be the one to interfere with the domestic concerns of the shipowner. It is hardly open to doubt that withdrawal of publicity has an adverse effect on goodwill.

What of the future in the shipping world? Will events run true to the pattern of 1919 and on? Who will be the world's carriers and how much will there be to carry? Many people would like to know the answers. In any event it would appear that Great Britain and the United States will be possessors of the bulk of the world's carrying tonnage: there are no "neutrals" to wax fat at the cost of the belligerents as in the last war, but one feels that the Americans will strive hard to maintain the place in world-carrying that their war effort has created for them.

Indication that the Americans have their eyes firmly fixed on post-war traffic was contained in a special resolution passed by the Propeller Club in New York last September and circulated in the form of a statement to Rear-Admiral Emory S. Land, U.S. War Shipping Administrator, and to some 200 Propeller Clubs all over the United States. The text of the statement is illuminating inasmuch as it clearly indicates the trend of thought of those Americans who are anxious to develop a forward merchant navy policy for their country.

"It is, of course, well known that very few ships are available to-day for privately conducted trade," the club declared in its statement. "Such ships as are no longer available to Americans for commercial purposes are performing a splendid service in the grim job of winning this war. This board is firmly convinced that by means of advertising and publicity in the daily Press, periodicals and the various shipping and marine publications throughout the country the American public should be kept informed as to the essential war services those ships are performing, and more particularly why there are practically no ships available for privately conducted foreign trade during the current war emergency. This board, moreover, deems it only fitting and proper that the American public should be constantly reminded of the vital need for a strong and efficient American merchant marine in the post-war years."

Explaining that it was recognised by the board that the American Press generally has supported the American Merchant Marine the club pointed out that the continued support of the American daily Press and the various marine and shipping publications "is vital in the critical years which lie ahead.

"The members of this board respectfully recommend to the War Shipping Administration that the latter, in allocating ships for operation among the various American steamship companies, allow, or make provision for reasonable expenditures for, both publicity and advertising in all future General Agency contracts—first, for the purpose of supporting the War Shipping Administration's efforts to safeguard the future of the American merchant marine; and, secondly, to maintain, on the part of established American flag shipping services, their respective names, prestige and business contacts with the shipping and travelling public throughout the world."

That statement clearly indicates what British shipping may expect to have to face while British shipbuilding and marine engineering will be up against equally serious competition from yards that have leapt from marshland to staggering figures of monthly production in a very short time. It is therefore seriously suggested that British firms should take a leaf from the American book and make full use of the powerful assistance which their trade Press can give and is only too glad to have the opportunity of giving towards maintaining the prestige of British shipping all over the world after the war. There is much that the trade Press can do given adequate, wholehearted support by the leaders of the industries concerned. Let them decide to support to the full their trade papers, put their decisions on trade policy into effect, and by co-operation ensure the maintenance of a powerful ally at the time when help will be most needed.

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